REVIEW

FLIGHT

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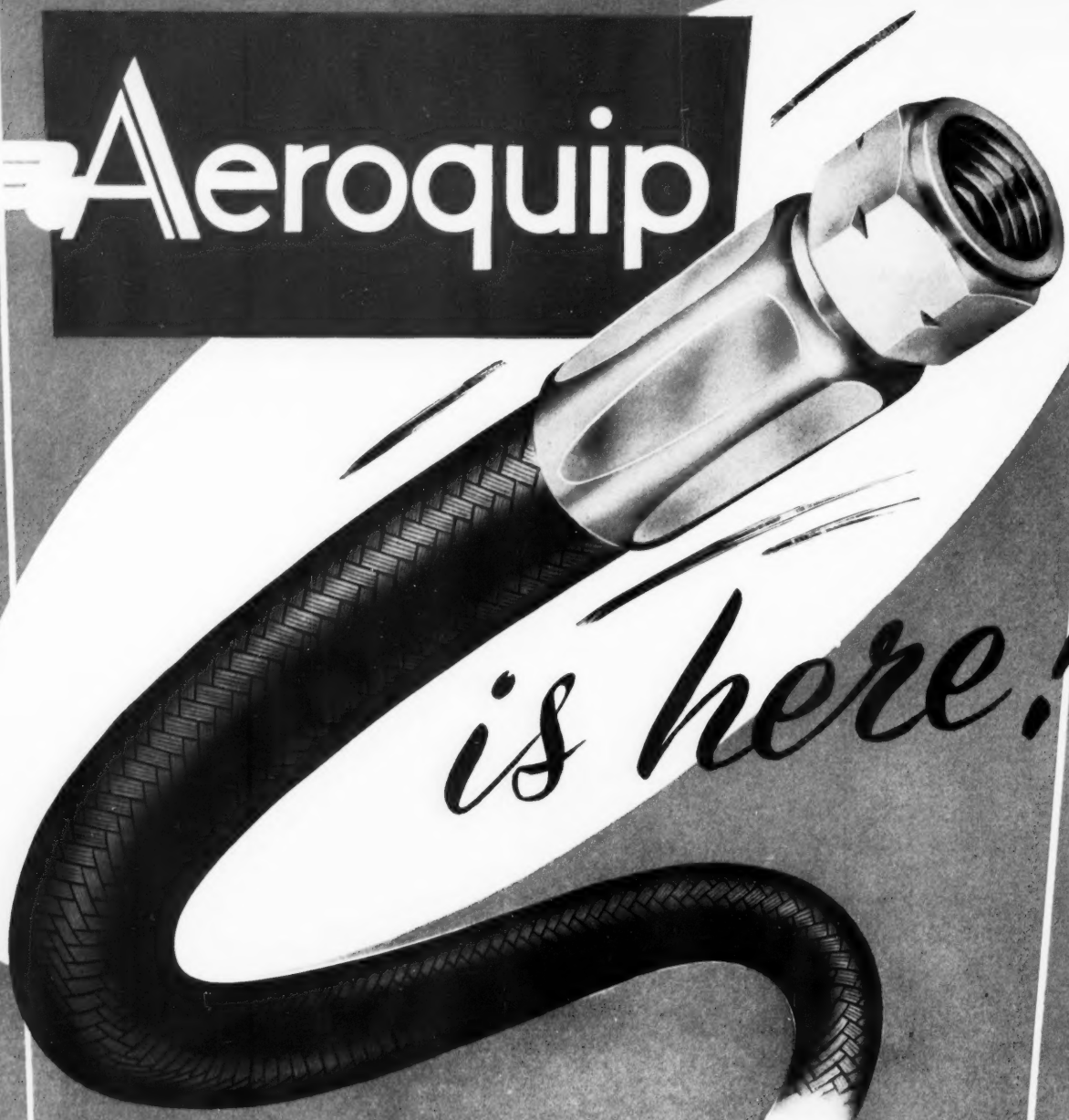
World's Finest Fighter Aircraft

HAWKER AIRCRAFT LTD., Kingston-on-Thames and Blackpool NORMAN TOMES

MEMBER OF THE HAWKER SIDDELEY GROUP PIONEER . . . AND WORLD LEADER IN AVIATION

Aeroquip



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THE NEW FLEXIBLE HOSE LINE WITH DETACHABLE RE-USABLE FITTINGS

Super Oil Seals and Gaskets Ltd. are privileged to announce that they now hold the British Manufacturing rights for the production of Aeroquip Flexible Hose.

With Aeroquip you make your own flexible hose assemblies by cutting bulk hose to desired lengths and attaching Aeroquip Re-usable fittings. Aeroquip can be assembled quickly and easily on the spot—no special tools are needed and no training is necessary. The result is a hose line exactly to your requirements that will give perfect service under high or low pressures, through a wide range of temperatures. Aeroquip is unaffected by vibration.

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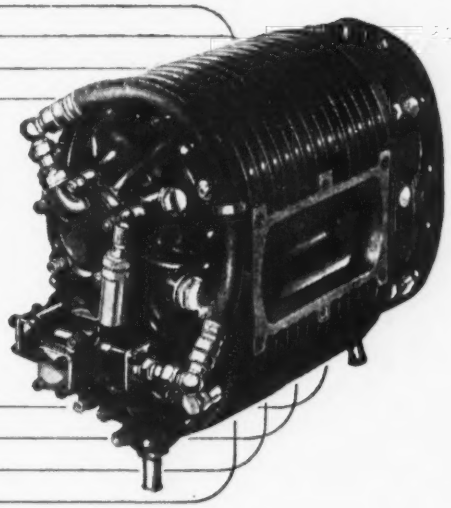
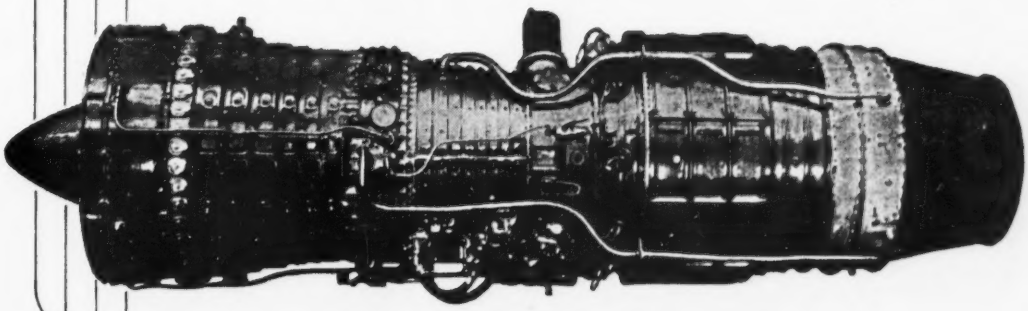
Cabin superchargers...?



....or Engine tapped...?



Whichever is adopted by the aircraft designer,
Godfrey air conditioning equipment will be required.
Godfrey cabin superchargers, cold air units,
water extractors, fans, etc, are installed in most of
Britain's modern civil and military aircraft.

Also in production:
Air conditioning trolleys, pressure testing trolleys.

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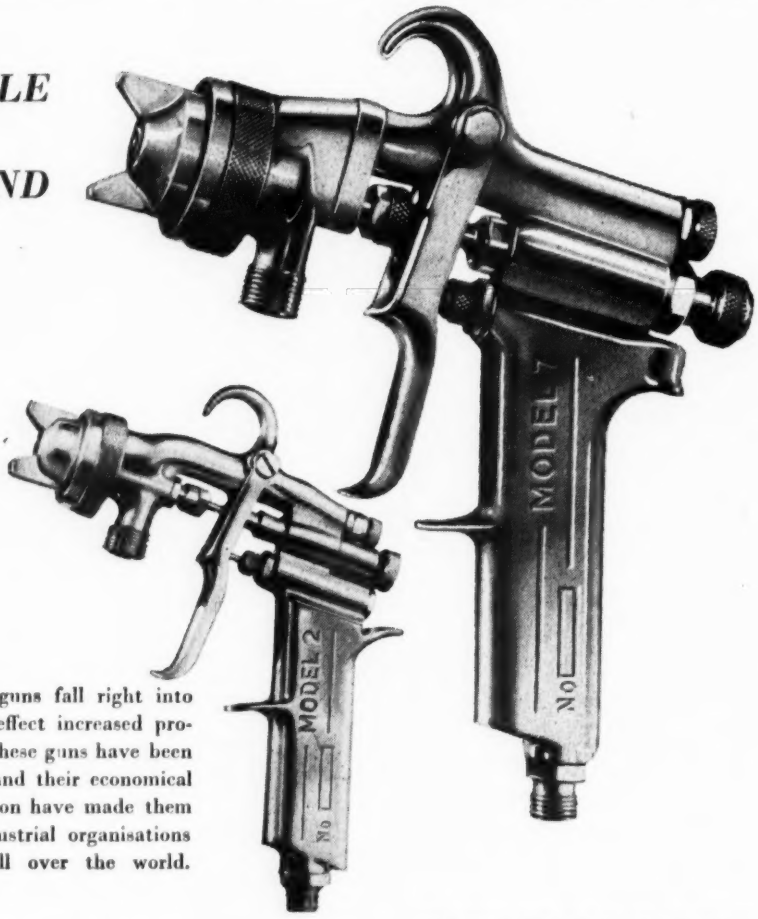

The A.I.D. Model 2 and Model 7 guns fall right into line with the need of industry to effect increased production and saving of man-hours. These guns have been put to every known practical test, and their economical performance and mechanical perfection have made them the outstanding choice of great industrial organisations and Government Service Depts. all over the world.

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AID

Overseas enquirers will receive prompt attention

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Sole Manufacturers: AIR INDUSTRIAL DEVELOPMENTS LIMITED. Aidspray Works, Shenstone, nr. Lichfield, Staffs, England. Phone: Shenstone 341/5. Grams: Aidspray, Shenstone. London, 28 South Molton Street, W.1. Phone: Mayfair 6318. Grams: Aidspray, Wesdo. Scottish Office, 90 Glasgow Road, Paisley. Phone: Paisley 3175. CANADA, 350 HILLCREST AVENUE, WILLOWDALE, nr. TORONTO, ONTARIO. PHONE: BALDWIN 1/2677.

ETHELBERT AND THE TRUSTY BLUDGEON

In days of yore there lived a famous old warrior, one Ethelbert, who armed himself with a club or bludgeon of such weight and size that all who looked upon it quaked in their sandals and fled. No, not quite all. Ethelbert's cave was dry and warm, his wives were the loveliest and most pulchritudinous in the land, and in certain hearts envy proved stronger than fear.

One day Ethelbert was attacked by a neighbouring tyrant named Osric. Ethelbert swung his club and dealt Osric a heavy blow on the skull or noggin, but strange to relate the tyrant survived. He was down . . . and up like a flash and was soon using his own club to some purpose . . .

"That club of mine," thought Ethelbert, while his womenfolk were charming away his bruises, "is neither big enough nor heavy enough. I must make another of the toughest oak and I must bury weighty flints in its business end."

The new club was hardly completed before Ethelbert was attacked again. As his adversary came in the old warrior swung his club . . . but its reinforced warhead proved too heavy for his grasp. The weapon flew from his hands and buried itself in a swamp twenty cubits distant.

How Ethelbert survived that encounter he never knew. Battered and sore he resolved to fashion an even stouter club and to secure it to his body by means of a strong leather harness.

A month later his cave was invaded by Ulser the Bad, one of the boldest thugs in all the land. This time Ethelbert was able to retain his club, but so cumbersome was his harness that his blows were few and far between, and Ulser the Bad belaboured him repeatedly and painfully.

The battle raged for eight hours and ended only when both men were too exhausted to do more than paw the air and stagger in ever-widening circles . . .

When Ethelbert's wives found him they dragged him back into the cave and applied healing herbs to his wounds. For three nights he lay unconscious and for three more he was delirious. "Club, club, club . . ." his wives heard him moan, "bigger club, stronger harness, more flints . . ."

And when his fever subsided he called immediately for oak and cutting tools.

"Another even bigger club?" said his wives.

"Not this time," said Ethelbert, grinning, "I'm going to see what I can do with a smaller model, and what's more I'm going to arm all of *you* with clubs, too—just in case. Neat, handy little instruments with a kick like a mule. I don't want to get involved in another show like the last one."

In pursuance of their firmly held beliefs in matters of twentieth century defence against air aggression, Folland Aircraft Limited, of Hamble, Hampshire, have undertaken an intensive programme of research, design and prototype development. Visitors to Britain who would like to know more about this programme are invited to communicate with the Company The telephone number is Hamble 3191.

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FORWARD FACING } **96.** { AFT FACING

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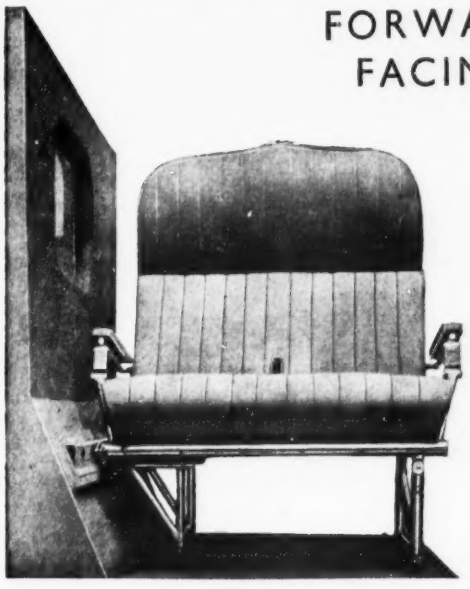

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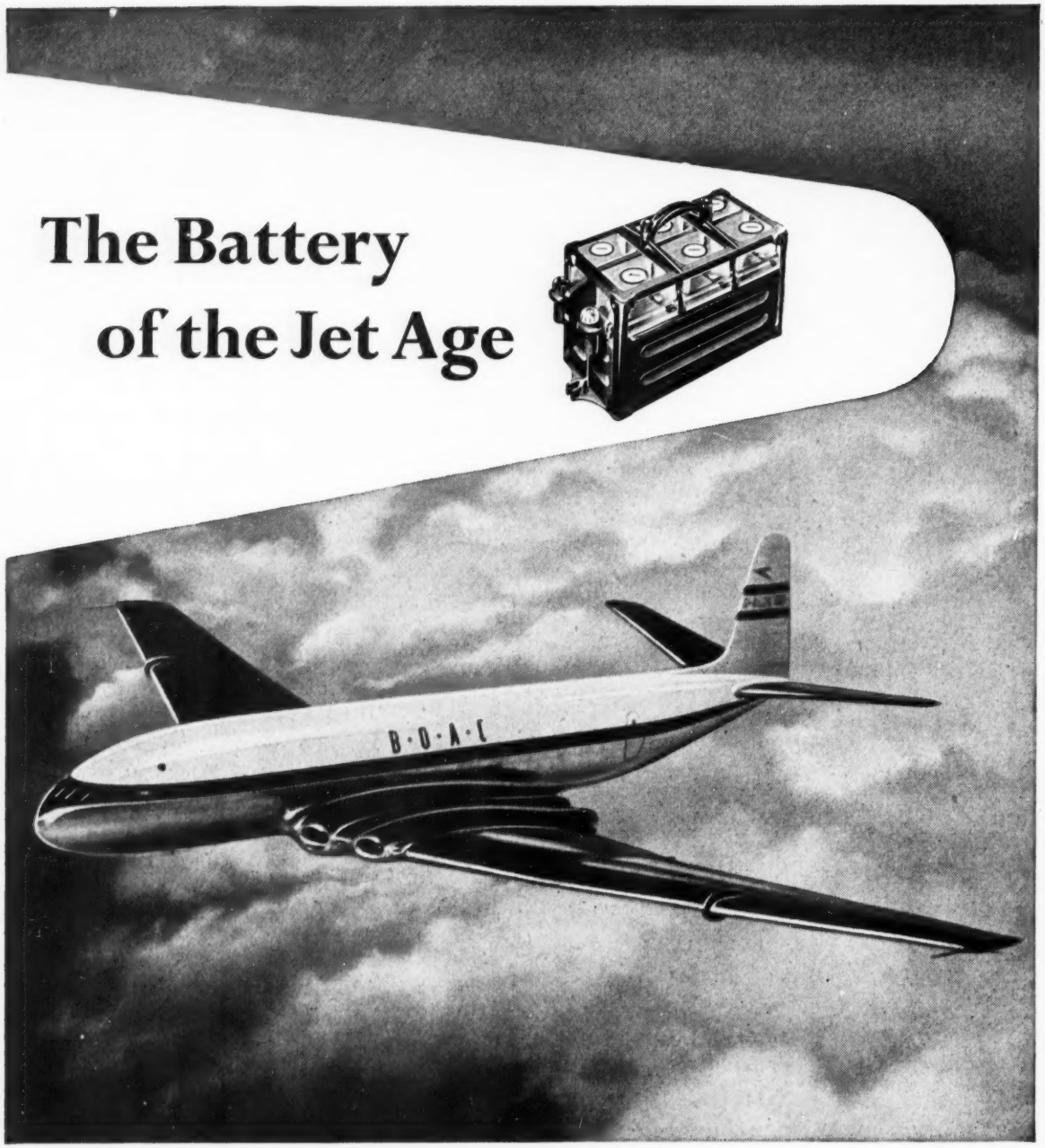
The Battery of the Jet Age



P.R.16

The *Comet* is equipped with batteries specially developed by Dagenite in consultation with de Havilland. As a matter of fact, Dagenite Batteries are standard equipment on all de Havilland aircraft. And the weight/capacity ratio of the Comet's batteries is the lowest yet achieved in jet aircraft battery construction.

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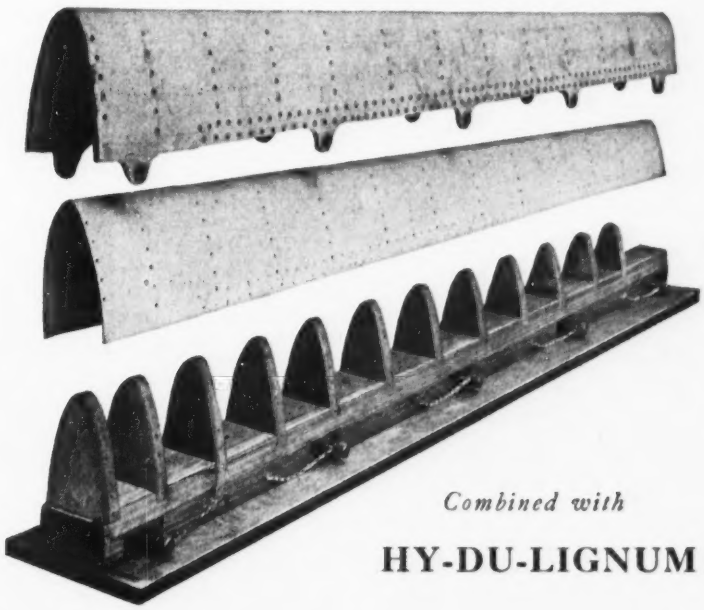

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"the made-to-measure wood"
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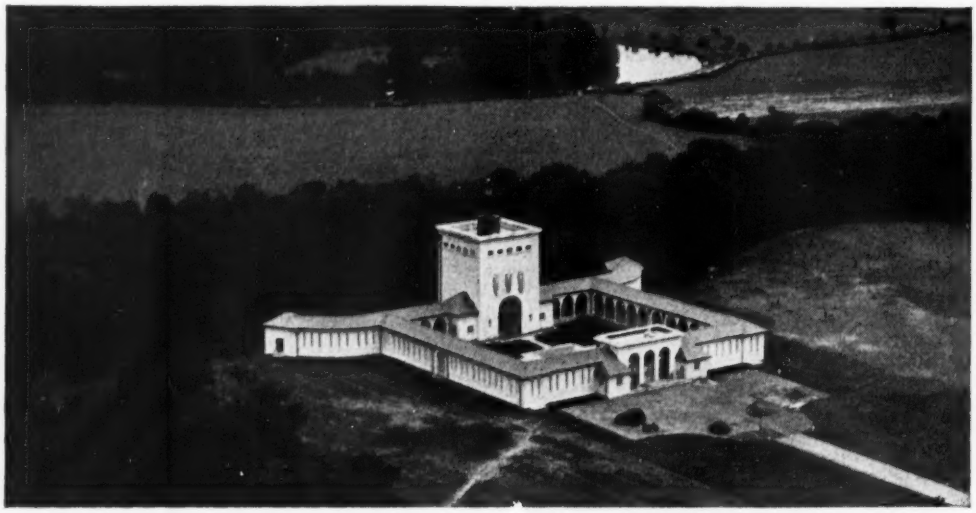

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So Many More than the Immortal Few!

In the Battle of Britain the Immortal Few held the vital skies above us and hurled back the tide of invasion until our Squadrons, gathered here and from the Commonwealth, with staunch allies, assembled to fight on to victory.

Part of the cost of victory is inscribed on the walls of the Runnymede Memorial which Her Majesty the Queen will unveil on October 17th.

Once more during the BATTLE OF BRITAIN WEEK, we ask YOU, in humble gratitude for this great deliverance, to remember the dependants of those who died for us and the disabled and helpless.

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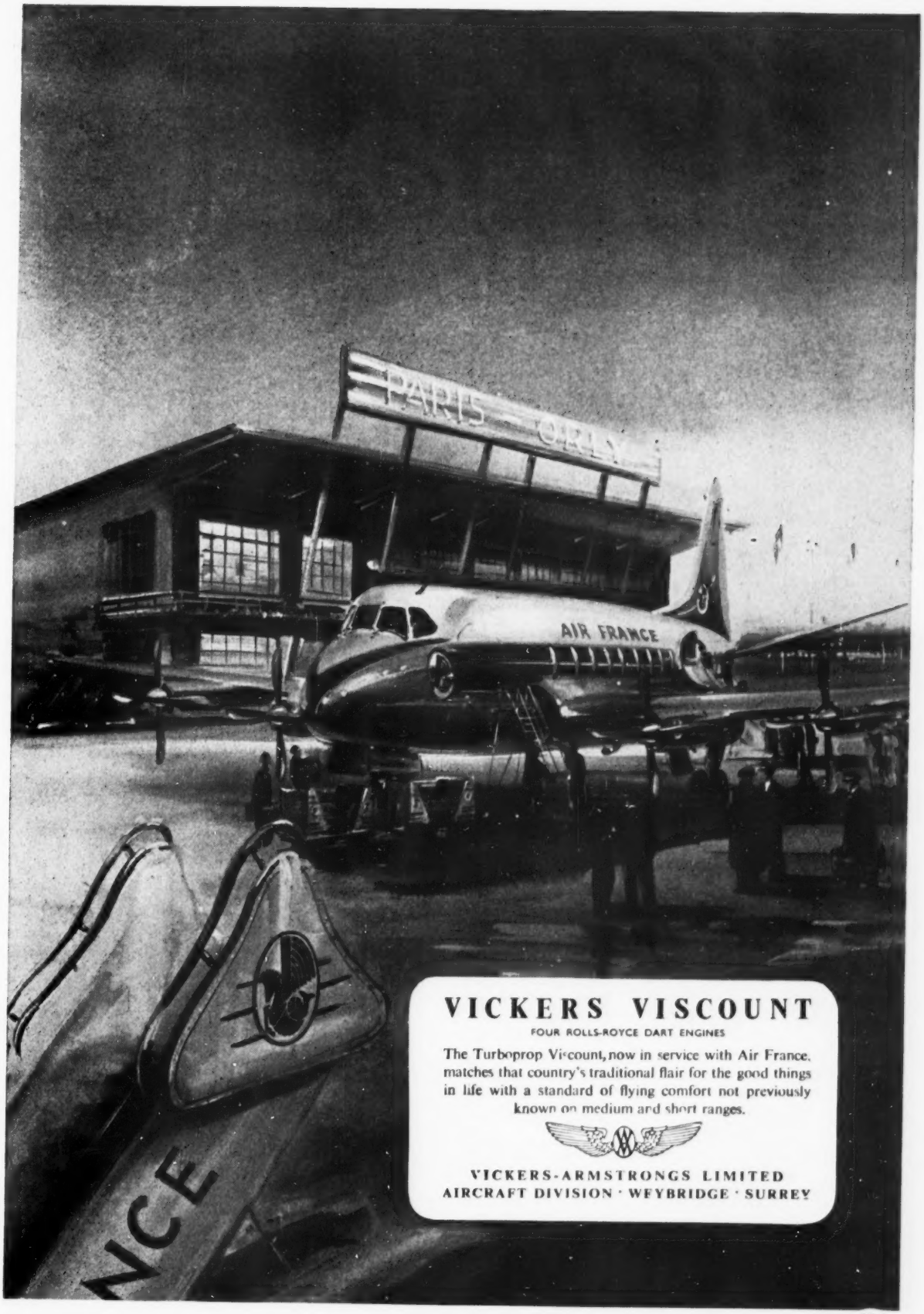

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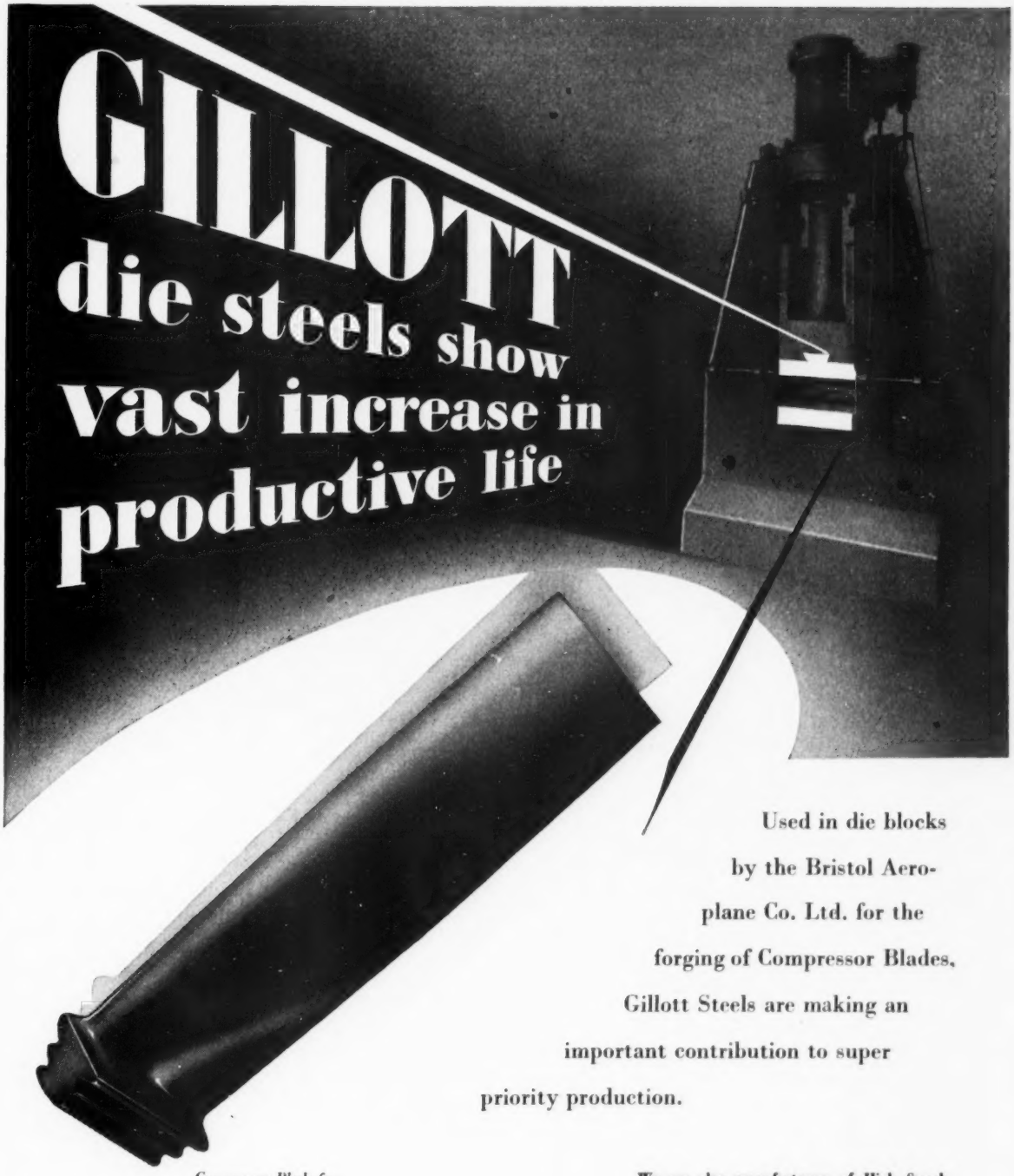

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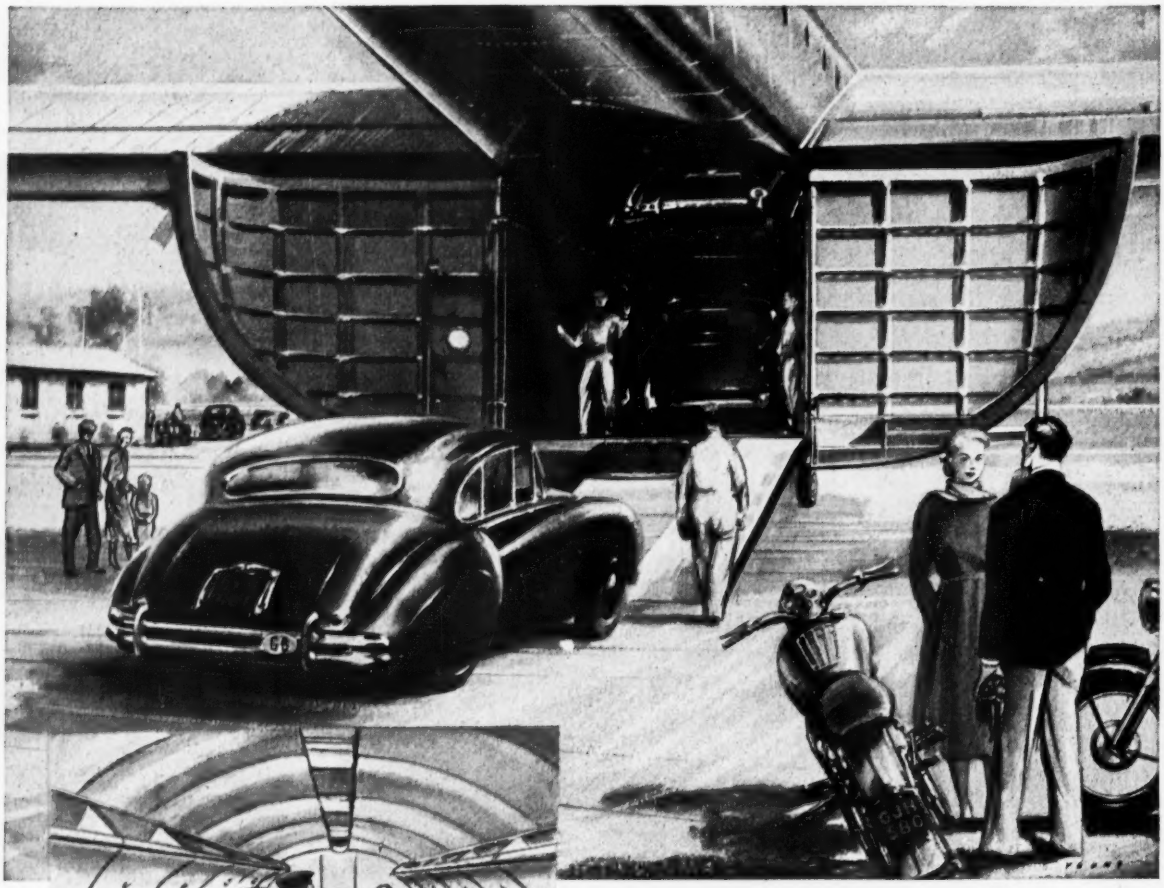

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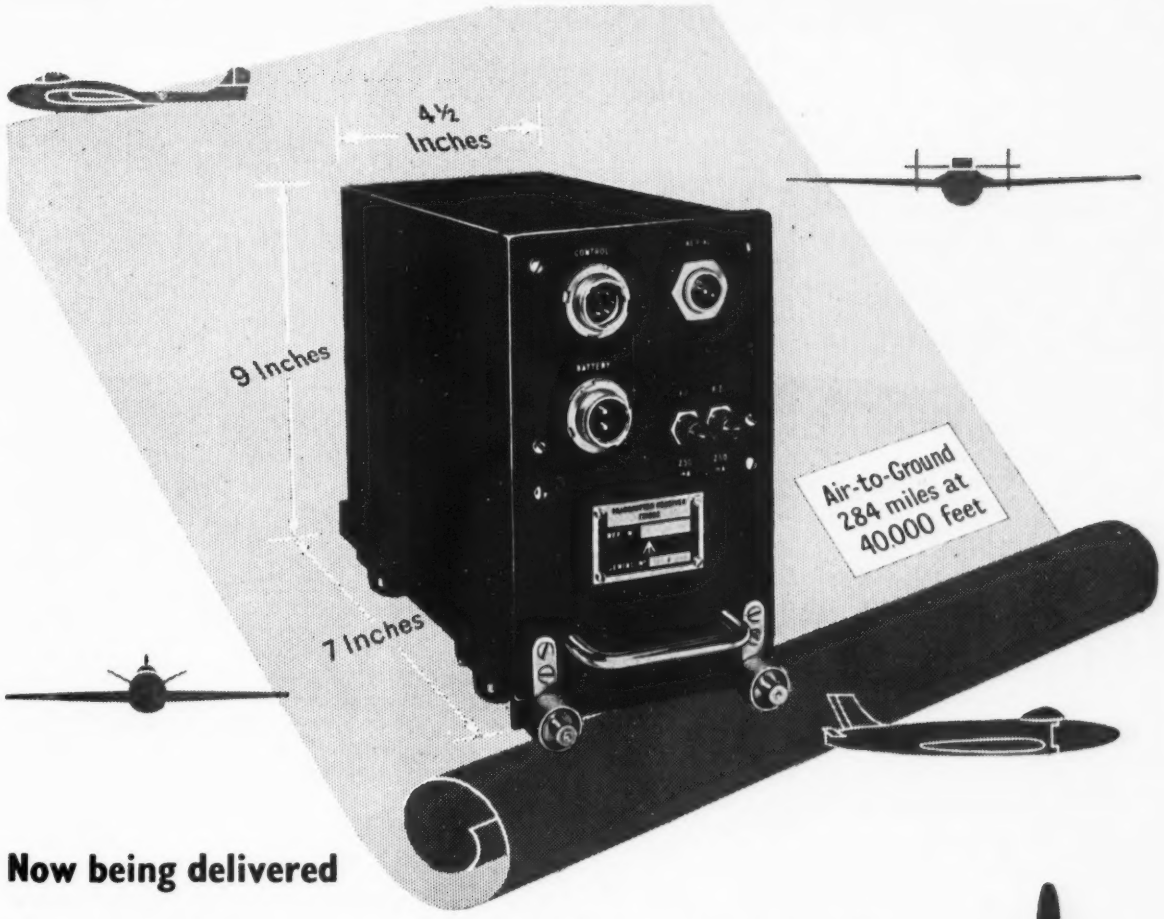

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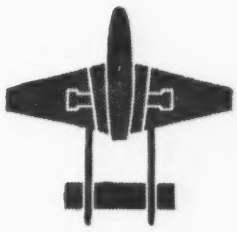

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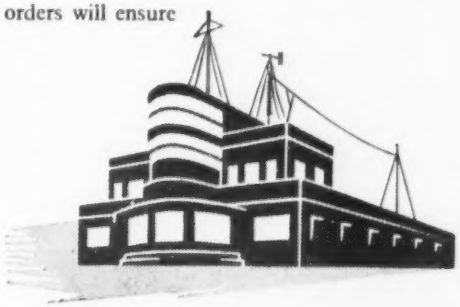

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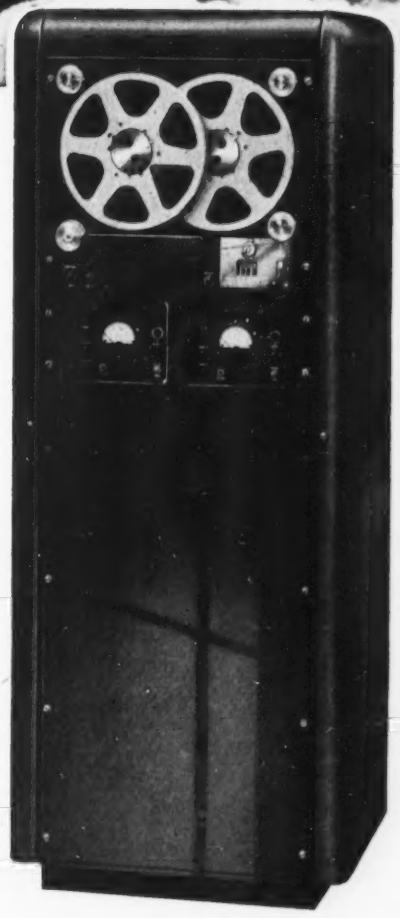

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TYPE LDT-7

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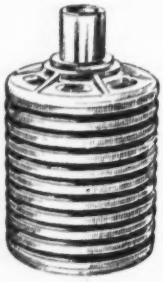

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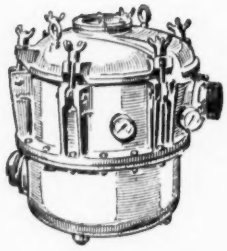

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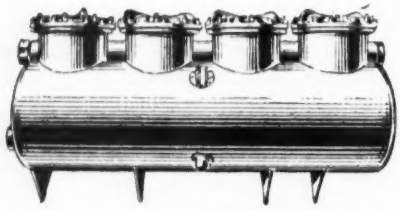

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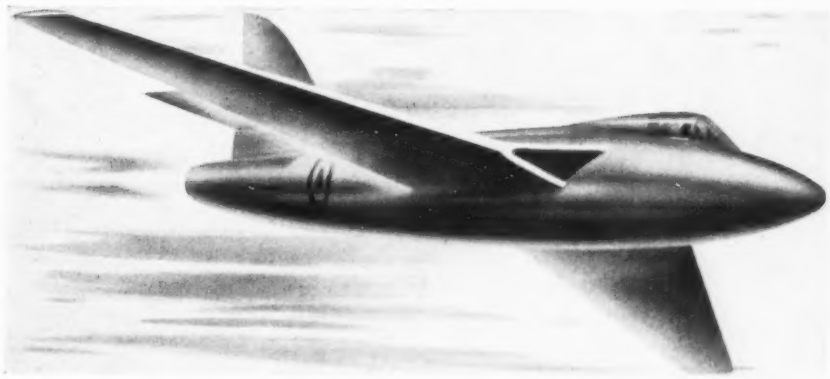

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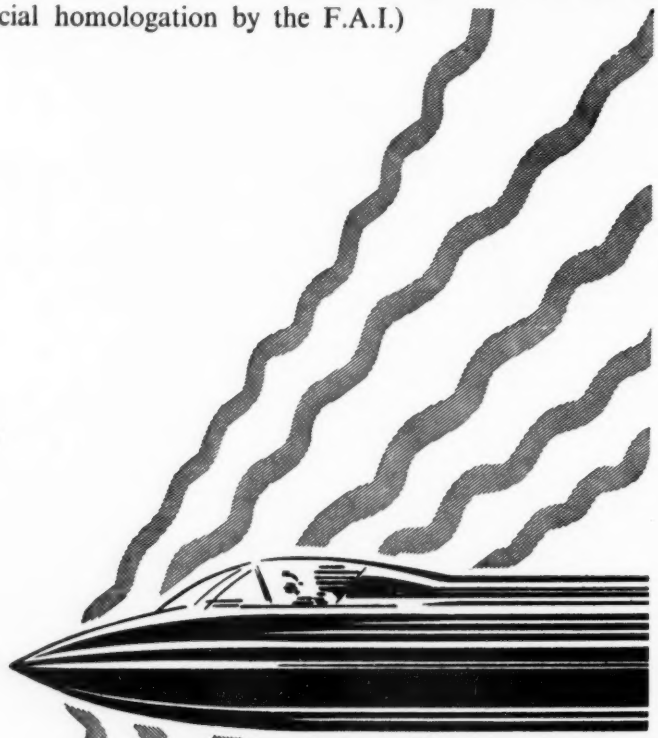

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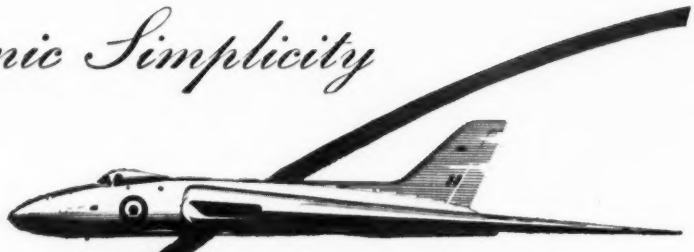

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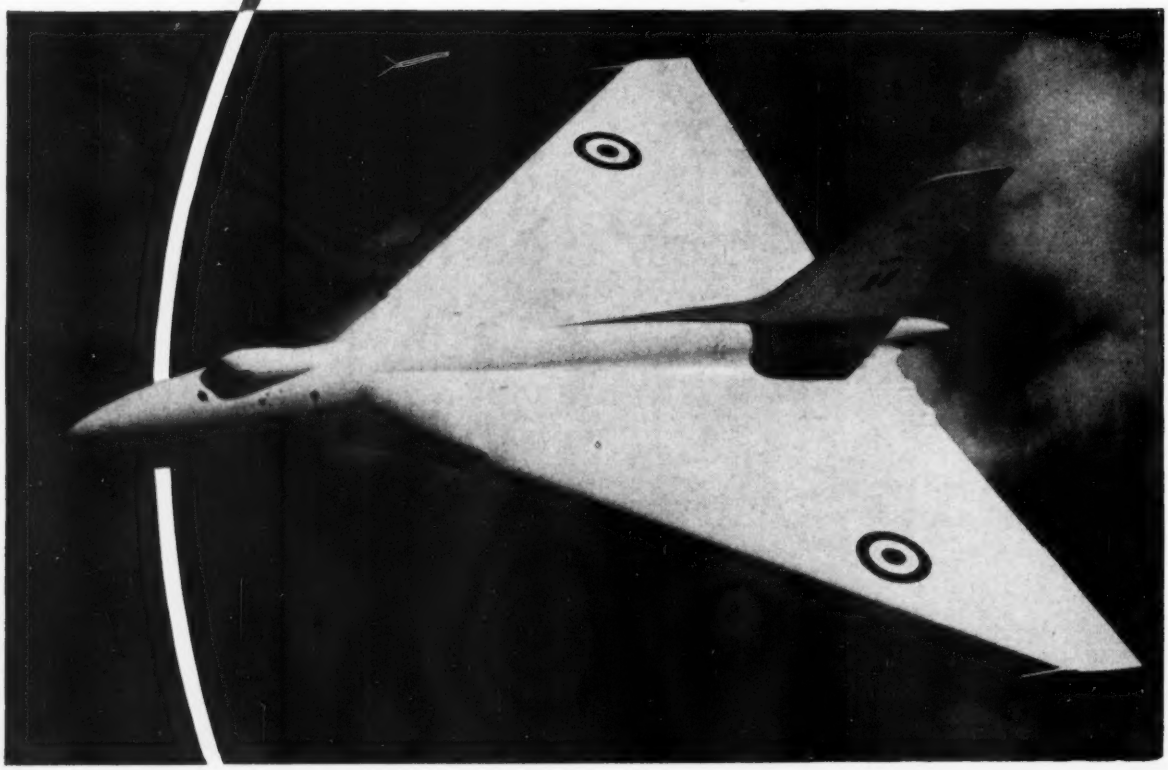

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and
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To Sum Up . . .

HOW did the Show go off? We have examined our own thoughts on the matter; and we have considered the many impressions conveyed to us by visitors from home and abroad. Certainly it was a rather different Farnborough this year—upon that almost everybody was agreed. We would go further and say that anyone who was disappointed with the technical aspects of the Display and Exhibition had only himself to blame, for the closer one's examination of all that was shown the more apparent became the evidence of important technical consolidation and advances. In this respect it was a more mature exhibition than in previous years, with less of the obviously spectacular.

This being so, it seems somewhat incongruous that the less responsible dailies should have printed such a spate of trivialities about the pilots and occasionally about some unimportant aspect of the aircraft displays. Sensations they were determined to find, though for these they must have found the 1953 S.B.A.C. Display a barren hunting-ground.

We note that sections of the French press printed derogatory reports about the flying display, and even about the aircraft, comparing Farnborough unfavourably with their own spectacle at Le Bourget. Perhaps some of the remarks in our opening paragraph are applicable here; but in any case the writers leave themselves open to a reminder that the old saying about empty vessels might be applied to more than their ramjets. Admittedly there was some fine, spectacular NATO flying at Le Bourget this year, but we do not think that this sort of international display flying would be an appropriate addition to the serious flying demonstrations of the British industry pilots at Farnborough. Mr. Burroughes, president of the S.B.A.C., said as much in his speech at the inaugural dinner in London.

The Americans with whom we talked were generous in their praise, particularly of the gas-turbine transports. With justification, though, they indicated their confidence in their B-52 eight-jet bomber and F-100 fighter to match any foreign contemporary.

The differences in the flying this year were in part due to new regulations intended to reduce the risk to the general public in the event of an aircraft meeting with an accident. Whether or not they would have made any appreciable difference is a matter for conjecture. But, not unnaturally, the test pilots—who are the experts in this sort of work—were reluctant to accept regulations which curtailed carefully planned demonstrations and reduced their effectiveness in showing-off the capabilities of each aircraft. As a result—for example—the impressive tight, low turn within the boundaries of the airfield was not permissible because at one point it would have entailed flying towards the crowd. The reason for the relative absence of aerobatics (those seen were appropriate to the aircraft type and of the highest standard) is not apparent, but may indicate a change of aim and ideas on the part of the pilots. It may also have been concerned in some instances with the equipment carried in the aircraft.

Those who spent every day, or several of the days, at Farnborough detected a change in the flying displays on the Friday, when the public were admitted for the first time during the week. Then there were more aerobatics, steeper turns, and the accent was seen to be upon lively display flying for the spectators, with, perhaps, a little less attention to the interests of the technician.

The wide publicity given to pilots' grievances and rebukes was regrettable and brought no credit upon anyone (though we must admit to a smile at the headline "Jet Jockey Gets Rocket"). But during a period when pilots are giving their aircraft and the spectators "the full treatment" they are understandably tense and sensitive about instructions and rebukes and how and whence they come.

That fewer entirely new aircraft were to be seen this year is in a sense encouraging, for it means that a more advanced stage has been reached when production of one or more suitable designs in almost every civil and military class is in hand. Most of the aircraft seen by visitors this year are, in fact, in production, and many are already in service or about to go into service. For that reason they are the more attractive to the prospective buyers who comprised the majority of the important S.B.A.C. guests.

FROM ALL QUARTERS

BIGGEST WHIRLER: Representing the present ultimate in the Piasecki tandem-rotor layout, the big YH-16 Transporter is here seen at Philadelphia International airport, with a Navy HUP-2 and (airborne) an Air Force H-21 Work Horse. The H-16 is powered by two Pratt and Whitney radials, and can seat 40 troops; bulky freight can be loaded through the large rear door. The YH-16 will fly as soon as ground running tests are finished.

Avon-Comet's South Atlantic Crossing

COMET G-ALYT, the Avon-powered development aircraft now on loan to B.O.A.C., completed the first crossing of the Atlantic by a civil jet airliner on Monday, when it landed at Rio de Janeiro at 1520 hr B.S.T., after flying from London Airport *via* Lisbon, Dakar and Recife. Carrying a crew of nine, and ten passengers, among them Sir Miles Thomas, the aircraft completed its 5,820-mile journey in 20 hr 50 min. The Minister of Civil Aviation, Mr. Alan Lennox-Boyd, was among those who watched the departure of the Comet at 1830 hr on Sunday. The following afternoon B.O.A.C. received this characteristic message from the chairman: "Comet with Avon jets crossed South Atlantic last night in 4½ hours despite diversion avoid severe electric storm 8½ miles high on equator, B.O.A.C.'s Captains Peter Cane and A. M. Majendie thus becoming pioneer civil jet Atlantic fliers. This marks further spread B.O.A.C. web of jet trails world-wide. We had tea London, dinner Lisbon, good sleep at 500 m.p.h., breakfast Brazil. How's that for going places?—Miles Thomas."

On Monday night Sir Miles cabled again: "Eighteen men and a girl made fastest-ever trip London/Rio in Comet 2 today, in 12½ hours' flying time. Captains A. C. W. Cane and A. M. Majendie did practice approaches at all airports on route, carrying out 'shake-down' and familiarization routines. Overhead time easily constitutes record . . . [Argonauts take about 31 hours elapsed time—Ed.] Comet made two circuits over Rio before landing. Excited crowd at Corcovado and Copacabana Beach. Good follow to Farnborough. This is British prestige day in Brazil. Flight is vindication our faith in de Havillands and Rolls-Royce."

Record Round-up

SUMMER is ending in a veritable spate of air record-breaking. Less than a fortnight ago Neville Duke with the Hunter recaptured the World Speed Record for Britain at a speed—subject to F.A.I. confirmation—of 727·6 m.p.h. Now comes the news that Vickers-Supermarine are to try to wrest the record from Hawkers, and that, in the hope of ideal conditions, the attempt may be made in North Africa. Meanwhile, an almost equally sought-after record, the 100-km Closed Circuit, is to be Duke's new objective; held since May 18th by Miss Jacqueline Cochran (Sabre F-86EO) at 652.55 m.p.h., it was raised at the beginning of this month to 690.118 m.p.h. by Brig. Gen. J. S. Holtoner, commander of Edwards Air Force Base, California, flying an F-86D. The new figure awaits ratification.

The Vickers-Supermarine decision to explore the possibilities of the Castel Benito, Libya, area for their attempt (survey and servicing teams are already there) is based on the fact that the high ambient temperature that may reasonably be expected will increase the speed of the aircraft, which in this case is to be the Swift F.4—the blue-painted machine demonstrated at Farnborough—with Avon engine and reheat. Either Lt. Cdr. Mike Lithgow or his assistant test pilot, F/L. Dave Morgan, will be the pilot. In order to exceed the Hunter's speed by the one per cent margin officially required, the Swift will have to average nearly 735 m.p.h. over its four runs. News of the Libya plans raises the interesting speculation as to whether, if the Swift succeeds, Hawkers might try to go one better—if so, to make it a Group effort, the Sapphire-Hunter might be used.

The course for Duke's 100-km attempt is to be a triangular one in the neighbourhood of the Hawker airfield at Dunsfold, Surrey though, at the speed at which the Hunter must fly, the triangle is likely to approximate more nearly to an irregular circle; there can, of course, be no question of a straight approach to a turning-point and then a sharp vertical turn, as commonly seen in air racing. As we go to press it is understood that preparations for the attempt are well advanced, and that little more remains to be done other than awaiting suitable weather.

Gen. Holtoner's 690·118 m.p.h. record was established during the recent heat-wave in America; it was not announced until September 7th, a week later; this was at Dayton Air Show, when it had become apparent that the speed would not be improved upon in the cooler conditions by then prevailing.

Three other noteworthy records—all three subject to F.A.I. confirmation—were made public at the same time: Capt. H. E. Collins (F-86D) raised the 15-km record to 707.889 m.p.h.; Capt. Russell M. Dobyns took a Piasecki YH-21 ("Workhorse") helicopter to 21,200 ft, thus breaking the long-standing helicopter altitude record established in 1949 by a Sikorsky S-52; and the same pilot secured a new helicopter world speed record by averaging 146.735 m.p.h. for four 3-km runs in the YH-21; his best downwind run was at 156 m.p.h. The existing record was at 129.552 m.p.h. also to the credit of an S-52 in 1949.

Independents Gather in London

EXECUTIVES from independent operators of Spain, France, Belgium, America, Italy, Norway, and the United Kingdom attended the annual assembly of the International Federation of Independent Air Transport Operators (F.I.T.A.P.), which was held last week in London. The association now comprises 23 companies operating 250 aircraft, of which 70 are four-engined. The assembly was visited by the Minister of Civil Aviation, Mr. Lennox-Boyd, and his Parliamentary Secretary, Mr. Profumo, and also by representatives of I.C.A.O., the International Air Brokers Association, the International Chamber of Commerce, the F.A.I. and the International Federation of Travel Agents.

Important announcements regarding re-equipment were made during the assembly, reflecting the healthy state of member-companies: Fred Olsen Airtransport, the Norwegian operators, have ordered two Viscounts; French independent operators intend to buy ten more DC-6s; and Silver City Airways are placing an order for additional Bristol Superfreighters for their cross-Channel car ferries. F.I.T.A.P.'s 1952-53 president, A.Cdre. Powell of Silver City, becomes honorary president and has been succeeded in his present office by Mr. Ludvic Braathen.

On leaving the meeting, incidentally, Mr. Lennox-Boyd drove to Southampton to make the nine-minute air ferry journey to the Isle of Wight. The following day, Saturday, he flew from Cowes in the Saunders Roe Princess during its demonstration over Farnborough.

R.Ae.S. Occasions

IN this fiftieth year of powered flight the Royal Aeronautical Society's Wilbur Wright Memorial Lecture was given last Monday by Mr. N. J. Hoff, professor and head of the Department of Aeronautical Engineering and Applied Mechanics of the Polytechnic Institute at Brooklyn, in New York. The lecture was delivered at the Royal Institution, Albemarle Street, London, and the subject was *Buckling and Stability*. Mr. Hoff introduced his paper by noting that although columns built almost five thousand years ago still stand in Egypt, the first theoretical calculation of the load-carrying capacity of columns was published by Euler only 209 years ago. He then developed his arguments progressively through his specialized lecture, and in his conclusions stated that a short column compressed in the testing machine with the distance between its two ends fixed could be stable when the disturbance was large; consequently it might buckle before its stability limit was reached in the sense of the classical small-deflection theory.

A column whose material was subject to creep was unstable under a compressive load of any magnitude, but it might not buckle during the lifetime of the structure of which it was a part. Buckling under a static load following a disturbance had many aspects differing significantly from buckling during a loading process, particularly when the latter was rapid.

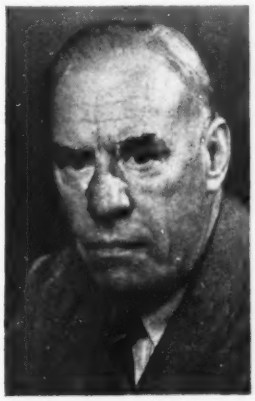
For these reasons it was desirable to distinguish between the stability of a fixed system in the classical sense and the stability of a loading process. There was no reason to believe that an arbitrarily chosen loading test would furnish values that could prove or disprove the classical theory of static stability.

It seemed advisable to reserve the terms critical load and characteristic value of the load for the designation of theoretical loads at which the state of equilibrium was of a special character. Thus the load at which the limit of stability was reached in accordance with the classical small deflection theory, or even according to a large deflection theory, was properly called a critical load.

During the evening, the R.Ae.S. Gold, Silver and Bronze Medals were presented to Messrs. E. F. Relf, H. Grinsted and L. Boddington respectively, and other awards (as announced in *Flight* of August 28th) were also made. Later, a reception held at the Royal Aeronautical Society, 4 Hamilton Place, provided an opportunity for the Anglo-American Conference delegates to meet.

Capt. Bartlett Back to France

KNOWN—and liked—by countless aviation people abroad as well as in this country for the past quarter of a century, Capt. K. J. G. Bartlett has retired at the age of 60 from his post of sales director of the Bristol Aeroplane Co., Ltd. He is not, however, severing his connection with the company he has served for 25 years: he will retain his seat on the Board and will spend the greater part of his time in France as the firm's senior representative in Europe, in which capacity he will continue as a director of the associated concerns, S.E.C.A. in France and T.A.B.S.A. in Spain. His office will be in Paris.



Capt. K. J. G. Bartlett, C.B.E.

Capt. Bartlett's associations with Bristols began when he was with Gnome et Le Rhône in the early twenties. After acting in a consultative capacity for several years he received a staff appointment with the British company in 1928, acting as European representative of their engine department, with an office in Paris. His sphere of activity rapidly widened and in the years before World War II he travelled extensively on the company's business, becoming as well known in North and South America, and elsewhere, as in Europe.

At the outbreak of war Capt. Bartlett saw service with the R.A.F. in France, but after the fall of France he was released to the company and acted first as manager of their engine repair organization and then of the Rodney Works.

He was appointed a director in 1944, and after the war he was responsible, as sales director, for re-establishing the company's overseas sales organization.

In 1951-2 Capt. Bartlett was seconded to the Ministry of Supply as deputy chairman of the European Purchasing Commission. He is vice-president of the F.A.I., a member of the S.B.A.C. sales and export committee and one of the most senior members of the Royal Aero Club.

Behind the Farnborough Scene

EXCEPTING, perhaps, the duties of the demonstration pilots, undoubtedly the most demanding and responsible task at the S.B.A.C. Display was that of the R.A.E.'s air traffic control officers. In charge was the senior A.T.C.O., Mr. G. G. Harris, B.E.M., who is among the Establishment's "oldest inhabitants," with 40 years' service at the age of 62. He supervised aircraft maintenance at the R.A.E. in the inter-war years, and during the Second War he set up the flying control organization there; previously there had been only a simple "duty pilot" system. In one capacity or another, "Gil" Harris was associated with all the old Hendon Displays and with the S.B.A.C. Shows from their outset.

At Farnborough last week he was assisted by three control officers, who worked to a roster—changed each day—of deputy controller, emergencies controller (in R/T. communication with crash and fire tenders and associated services) and aircraft-park marshal. They were F/L. Lamb and Messrs. Hill and Aldritt.

Spreading a wider net—by radar—were the approach-control staff, Messrs. Pendry and Ford-Hutchinson. To them fell the job, among others, of positioning pilots for sonic bangs, sending them down to the South Coast and up from Brighton to Dunsfold, where they were given a heading on which to make their dives.

Lastly, but certainly not least, there were the met. men—Mr. Brown, seconded from Boscombe Down for the occasion, and Mr. Turner, the R.A.E.'s permanent "weather wizard."

Two Accidents

IT was unfortunate that an accident which occurred at Farnborough last week should in some quarters have been associated with the S.B.A.C. Display, whereas in fact it had no direct connection with it. On the Tuesday morning, an R.A.E. Sycamore helicopter crashed just after take-off, as a result of which the pilot, F/L. J. K. Hough, A.F.C., of the Royal Aircraft Establishment, lost his life, while his passenger, J. H. Heyworth, A.F.C., chief test pilot of Rolls-Royce, Ltd., received injuries.

It seems that the helicopter was somehow in a tail-down position immediately after take-off, and that, in spite of the tail-skid, the tail rotor struck the ground, causing the aircraft to overturn.

On the previous day Ken Hough had flown one of the two Avro 707As in the Display, and Harvey Heyworth was demonstrating the RA.14 Canberra.

A second accident which occurred last week involved two R.A.F. Meteors rehearsing for the Battle of Britain Fly-past. During the full-scale rehearsal on Friday the aircraft were dispersing over Hornchurch when two Meteors touched. One fell into Woolwich Arsenal, between two unused buildings, and the pilot, W/C. R. D. Yule, was fatally injured. The other pilot, F/Sgt. O'Callaghan, with slight head injuries, successfully put his damaged Meteor down at North Weald.

STANDING ROOM ONLY: Anyone who wondered whether aviation has a hold on the interests of the British public could have had his doubts dispelled by a visit to Farnborough last week-end. This "Flight" photograph shows a typical section of Sunday's crowd—estimated at 155,000.

FIRST PHOTOGRAPH the new Canberra P.R.7. Noticeable detail differences are the long intake "bullet" and a longer fuselage (which contains much new operational equipment).

HERE AND THERE

Royal Heron

UNDER construction at Hatfield—according to a report on which de Havillands express themselves unable to comment—is a Heron for the personal use of H.R.H. the Duke of Edinburgh. It is believed that he will use it mainly for private journeys within the British Isles.

Bendix Trophy Winner

FLYING a Sabre, Maj. William Whisner won the Bendix Trophy Race on September 5th from a field of nine other U.S.A.F. Sabre pilots. His speed over the 1,900-mile course, from Edwards A.F.B., California, to Dayton, Ohio, was 603.547 m.p.h.—about 50 m.p.h. faster than the race record established in 1951 by Col. Keith Compton.

Well-earned Retirement

NOW housed in America's National Air Museum is "Adaptable Annie," survivor of the 75 Boeing 247 transports built between 1932 and 1935. The type laid the foundation of the "modern" transport formula: its specification included retractable landing gear, two supercharged engines, autopilot, de-icing equipment, and the ability to maintain height on one engine with full load. "Annie's" career began when she was flown into third place in the London-Melbourne Race by Turner, Pangborn and Nichols in 1934; then she served two years with United Air Lines; and finally, during the war years, she was used as a "guinea-pig," first by the Air Safety Board and then by the C.A.A.

TOP TRIO: The three pilots who have flown the record-breaking Douglas Skyrocket. Col. Marion Carl (centre), who reached 83,235 ft on August 21st; Bill Bridgeman (left), who previously attained 79,494 ft and has since flown at 1,238 m.p.h.; and Scott Crossfield (right), who has flown the Skyrocket 39 times.

New Inst. T. President

RETIRING at the end of the month from the office of president of the Institute of Transport is Mr. C. T. Brunner, who will be succeeded by Mr. John Elliot. Mr. Brunner is a director and general manager of Shell-Mex and B.P., Ltd., and Mr. Elliot is chairman of the Railway Executive.

Brazilian Fokkers

THE agreement whereby the Fokker Company is to build aircraft in Brazil, foreshadowed last June, has now been signed. In a factory at Galeao Airport, Rio, 100 S.11 basic trainers are to be constructed, 50 S.12s (nosewheel version of the same type) and 50 S.14 jet trainers.

Alpine Soaring Achievement

WHAT is claimed to have been the first successful sailplane flight across the Franco-Italian Alps was made on August 24th by a Frenchman, Lucien Noun. After taking off from St. Auban-sur-Durance, he made a three-hour flight over mountains up to 14,000ft in height, landing in the Stoura Valley in Italy, some 50 miles from his French departure-point.

Mitsubishi Comeback

A COMPANY has been formed in Japan, with £160,000 capital, to design and manufacture jet engines. Four powerful industrial groups are interested—Ishikawajima Heavy Industries, Shin Mitsubishi Heavy Industries, Fuji Industries and Fuji Precision Industries. Application has been made for government subsidy, and it is hoped to start work this autumn with a research staff of 100.

Coventry Gas Turbine Lecture

ON Thursday next, September 24th, a public lecture is to be delivered in Coventry by Mr. W. H. Lindsey, M.A., F.R.Ae.S., director and chief engineer of Armstrong Siddeley Motors, Ltd., who will speak on the development of the company's aircraft gas turbines. Under the auspices of the City of Coventry Freemen's Guild, the lecture will be given at 8 p.m. in the Central Hall, Coventry.

Abbotsinch Air Day "Off"

IT is learned from the Admiralty that the "At Home" at R.N. Air Station Abbotsinch, originally fixed for tomorrow, Saturday, September 19th, will not now take place.

The Ubiquitous Helicopter

THE Australian Petroleum and Island Exploration companies are to use helicopters for transport of personnel and equipment in their operations next year. They will be carrying out oil survey work in Papua.

Modellers at Radlett

POSTPONED from August 23rd, the St. Albans Model Aero Club's All-Britain Rally takes place at the Handley Page airfield, Radlett, on Sunday next, September 20th. The meeting is from 10 a.m. to 6 p.m., and admission will be by programme, price 1s at the gates.

Chelsea College "Annual"

THE Aerauto Association (College of Aeronautical and Automobile Engineering) is to hold its annual dinner and dance at the Westminster Arms, Page Street, London, S.W.1, on October 23rd. The organizer is Mr. H. E. Fozard, Aerauto joint hon. secretary, at the College's H.Q. at Sydney Street, London, S.W.3.

FAR CRY from the days when, 44 years ago, he flew his 9 h.p. triplane at Lea Marshes: Sir Alliot Verdon Roe, now president of Saunders-Roe, Ltd., steps from the Princess (35,000 h.p.) after a flight last week.

AT THE HELICOPTER ASSOCIATION

A Lecture and Dinner : The Winter Discussion Season Begins

TOWARDS the end of Farnborough week, with its eloquent flying displays including those of several British ro.or planes, came the first lecture of the 1953-54 season, and the 7th annual dinner of the Helicopter Association of Great Britain. Given in the library of the Royal Aeronautical Society, on September 11th, the lecture was entitled *Problems Associated with Small Helicopter Development*, and was delivered by Commandant H. Boris, M.B.E., of the French company Helicop-Air. Chairman of the meeting was Mr. E. Mensforth, C.B.E., M.A., F.R.Ae.S., president of the Association.

Commandant Boris first gave details of his own company's experience in the operation of light helicopters, on many different types of work. After analysing the costs associated with the operation of these machines, he went on to suggest that an ideal small helicopter would consist of a basic "chassis" on which could be built different "bodies" for different rôles. The advantages to be gained from this arrangement were then described from the maintenance aspect and various other operating viewpoints. We hope to print a complete summary of the lecture and subsequent discussion in next week's issue.

Later the same evening the Association's 7th annual dinner was held in the Dorchester Hotel. The truly international assembly (it included many eminent helicopter names from Continental Europe and the U.S.A.) was the largest of any such occasion, and the guests of honour were Sir William Farren, C.B., M.B.E., M.A., F.R.S., F.R.Ae.S., president of the Royal Aeronautical Society, Rear-Admiral Caspar John, C.B., Deputy Controller of Supplies (Air), Ministry of Supply, A.V-M. T. M. McEvoy, C.B., C.B.E., who becomes Commandant of the Imperial Defence College on Monday next, Major-General G. S. Thompson, D.S.O., M.B.E., Director of Land/Air Warfare, and Commandant Boris.

Proposing the health of the guests, Mr. Mensforth first pointed out that the dinner came between two important aviation occasions, the S.B.A.C. show and the Anglo-American Conference. The numbers present, he went on, showed that it was fully realized that the Association ("this small bunch of fanatics") had a job to do and was continuing to do it. Education of the public to the use of the helicopter was an important part of this job.

Progress during the year had been considerable, the chairman continued. The value of helicopters in an emergency had been clearly shown by their rescue work during the Dutch floods, and the Association hoped that this knowledge would precede the extension of the helicopter's use to similar functions, such as police work, civil defence and ambulance duties. For the British helicopter manufacturers the year had been mainly one of consolidation in design, while, on the operating side, the activities of the pioneering airlines had emphasized the exciting developments ahead.

The Association's guests that evening came from all parts of the world and included M. Anselm Verniewe (who gave the season's opening lecture one year ago), and this international aspect was next mentioned by the President. In many countries, he said, other helicopter associations had been founded. In Britain, the support of the Services and of industry remained a valuable and important factor, but he believed that "people who issued specifications for 90-seat (and larger) machines should get some operating experience in with eight-seat machines first." In conclusion, Mr. Mensforth thanked Sir William Farren for the help given to the Association by the Royal Aeronautical Society.

Replying on behalf of the guests, Sir William Farren praised the independence of this country's helicopter enthusiasts ("you are even more independent than the aircraft industry") and went on to give details of his own helicopter experience. This experience began in the 1920s but it was only two years ago on a much diverted pilgrimage to Boscombe Down, begun by road and completed by helicopter, that the speaker had fully appreciated the utility of the rotary-wing machine. His interest in helicopters, therefore, was not merely academic.

Relations between the Royal Aeronautical Society and the Helicopter Association continued to be very cordial, Sir William went on, and to a great extent the two organizations shared members. The existence of groups such as the Helicopter Association the speaker believed to be a thoroughly healthy sign, for a specialist interest was not necessarily a narrow interest. How helicopter people managed to deal with this most complicated of all machines and still remain happy, however, he did not know.

After mentioning helicopter topics to be discussed at the Anglo-American Conference, the speaker concluded by announcing that, in March next year the Louis Blériot lecture would be given in Paris by Mr. Raoul Hafner on a subject associated with helicopters. This would be a very good occasion to let others know what this country was doing in the helicopter field.

AIR SAFETY SEMINAR

THE fifth air safety seminar organized by Flight Safety Foundation, Inc., took place at the College of Aeronautics, Cranfield, from September 11th-13th. These seminars are held annually (the last was in Bermuda in 1952) and this, the first to be held outside North America, attracted some eighty delegates, of whom nearly half came from the U.S.A.

For three days experts in various aspects of air safety discussed informally recent developments in their subjects. Organizations represented included the main world airlines, the armed forces of several countries, the civil aeronautics authorities and the manufacturers of aircraft and accessories contributing to safety. Although the scope of "air safety" could well include consideration of the aircraft structural design and of meteorological factors the fifth seminar concentrated on: (i) the avoidance of mid-air collisions by improved lighting and by radar warnings; (ii) the protection of the passenger during a crash or ditching and his survival afterwards; and (iii) the study of the physical and psychological problems of crew and passengers.

Mid-air collisions.—Reports on thirty-four mid-air collisions in America have shown that nearly all took place under Visual Flight Rules so that improved visibility of aircraft should be a helpful factor. The limited view from certain civil aeroplanes was criticized and the use of brighter, flashing lights and of surfaces polished or painted with glow paints was recommended. The identification of helicopters, perhaps by rotor blade tip lights, was a special problem.

Anti-collision radar is being developed and adopted, delegates were told, while improved air traffic control should reduce the chance of air collisions. It was inevitable that those concerned primarily with safety should welcome increased control and extra airborne apparatus if these lessened the chance of accident, but the prospect of radio for all would not be popular with the pilots of light aircraft, while the sacrifice of the weight of even one passenger for more radar would not appeal to the costs departments of the air lines.

Take-off and landing speeds.—Lt. Col. McCann (U.S.A.F.) described a standardized card supplied to pilots listing certain important speeds computed before take-off for the particular aircraft, runway, air temperature and humidity, weight, etc. Besides listing the optimum speeds for unstick, three- and four-engined climb and emergency approach at various weights, a "line speed" was listed. This was the speed which should be reached before the aeroplane crosses a yellow line painted across the runway, say one-third of the way along. A pilot failing to achieve this speed should stop for investigation. Accidents which had occurred due to engine power loss and wrong wind information could have been avoided by the use of this "line speed."

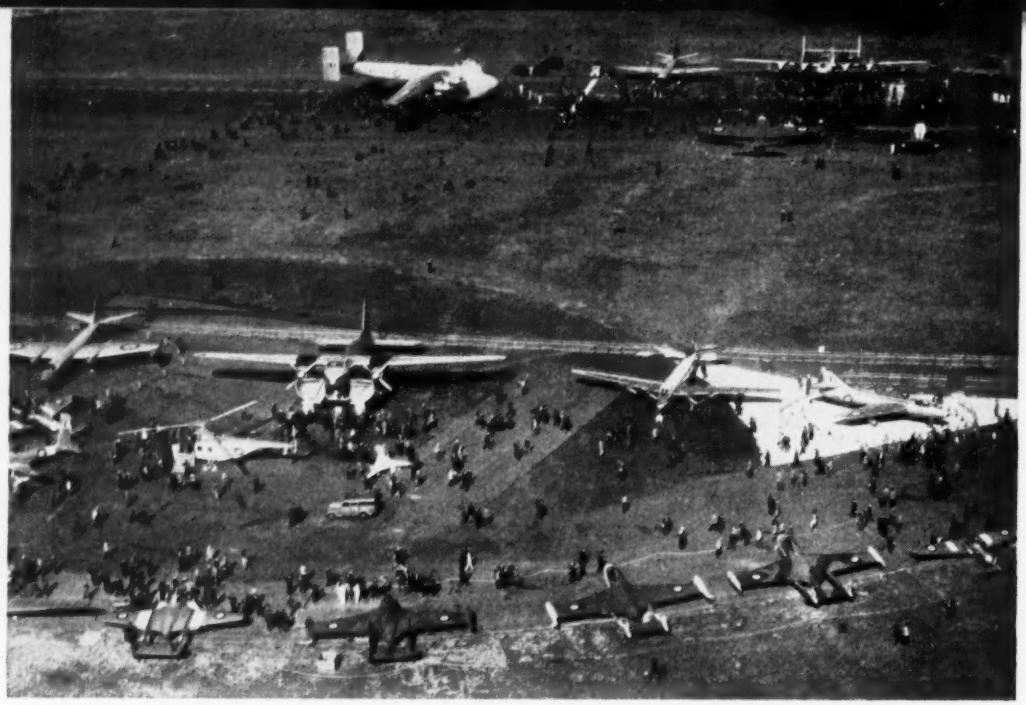
Rescue.—The film produced by Ultra Electric entitled *Sarah* (Search and rescue and homer)—reviewed in *Flight* some weeks ago—showed the functioning of a lightweight radio beacon carried by a passenger upon which an aircraft or a boat can home. The civil version, weighing only 20 ounces, is fitted to the life-jacket and, being powered by a sea-water cell, comes into action automatically when the passenger finds himself in the water. The Service type can be used for rescue from either land or water.

Another film, *Evacuation*, made for United Air Lines by Mr. Carl Christiansen, showed volunteers abandoning a DC-4 after a simulated emergency landing with the aid of a canvas chute from the rear door. It was found that practice by the crew in their special rôles greatly speeded evacuation, while tests in darkness showed the importance of emergency cabin lighting.

Mr. Jerome Lederer, director of the Flight Safety Foundation, described the accounts of crashes collected from survivors. These showed the very different human reactions to emergency and prompted a discussion on the advisability of briefing passengers about safety equipment. If passengers know how to use escape windows and life-jackets they can help the stewardess, but, for some, instruction would only cause alarm.

Mr. Walter Tye (A.R.B.) described tests in which uninstructed passengers attempted with varying degrees of success to fit life-jackets. It was observed that men attempted to wear them so that they buttoned down the front, but women preferred buttoning down the back!

Dr. Ross A. McFarland, of the Harvard School of Public Health, introduced a discussion on human factors in air transportation, the subject of his recent book. The need was demonstrated for thorough knowledge of the human senses of hearing, sight and smell and the effects on them of age and various distractions. A. H. Y.



In the foreground is the static park; beyond, a part of the viewing area for aircraft participating in the flying programme. Prominent are assorted de Havillands, two Provosts, the W. S-55, Canberra P.R.3, Bristol 170, a Heron and a Hunter. Beyond are the Beverley, three more Canberras, the Shackleton and Prince.

FARNBOROUGH'S FULL WEEK

The 1953 S.B.A.C. Show in Retrospect: Record Attendances: A Critical Appraisal

ONE more Farnborough Show has come and gone: one more week of intense, concentrated technical interest, of superlative mastery of men over machinery. Like a well-managed stage performance—for which the S.B.A.C., the R.A.E. flying control staff and everbody else concerned deserve congratulation—the whole thing went without a hitch; or, if there were any, they were skilfully concealed from the audience, in the best theatrical tradition. No untoward incident occurred to mar the Display flying.

Last week, in our account of the opening stages of the show, we mentioned the announcer's forecast that the new safety-precautions, which precluded pilots from making turns towards the spectators, or flying low over their heads, might detract from the spectacular nature of the event; and we went on to say that the subsequent exhilarating display had seemed to make the warning unfounded. But as the week's flying went on it did indeed become apparent that in comparison with previous shows something was missing. Yet how much, and of how superb a quality, still remained.

As last year, the show extended for a full seven days. Monday was a technicians' and Press preview and provided a full dress rehearsal of the flying; Tuesday, Wednesday and Thursday were guest days, an innovation here being that the flying on Thursday was confined entirely to the civil aircraft; Friday was the "public première", with fairly stiff admission prices; and Saturday and Sunday were the two public days, bringing record crowds.

The weather was co-operative. On the first two days the sun blazed without interruption from a Mediterranean-blue sky; later in the week the conditions made some attempt to return to more typically English standards, but achieved nothing worse than clouded skies and, for a time, a chilly wind.

Round figures issued by the S.B.A.C. showed that the first four days attracted a total of some 50,000 spectators; the public première drew 30,000; on Saturday came the rush—120,000; and on Sunday the attendance climbed to 155,000, which was far too much for anybody's comfort. Thus the grand total for the week, guest days and public days, was 355,000.

The tracks left by taxying jets inscribe great arcs across the viewing area. In the foreground are the Sea Hawk, P.111A, Avro 707C, Aiglet Trainer and Prestwick Pioneer; beyond, Bristol 173, a Heron and the Beaver.

WEEK-END CLIMAX

SUNDAY evening was calm, and a mist of reddish dust hung over the arid hillocks overlooking Farnborough's main runway. The brood of deltas taxied back to dispersal in proud procession; the hum of the Princess's ten Proteus subsided as the great ship headed back to Cowes; the crowd began to disperse, plodding almost ankle-deep in litter towards the congested exits for pedestrians, cycles and cars. The flying programme was over, and with it had ended the S.B.A.C. Show of 1953.

The public days proved a great success—and not only because huge numbers of people were drawn to Farnborough at the week-end. The effects of this year's restrictions on flying technique passed unnoticed by the majority; pilots gave their best and the crowd appreciated the fact. Each visitor, we are sure, took away a store of vivid impressions and the feeling that his journey, however difficult, had been well worth while. To many, perhaps, Neville Duke's arrival in the record-breaking Hunter is the outstanding memory—a double bang, directed by radar during the dive from Dunsfold, a soundless red dart streaking past with grey vapour flashing from the wings and a spurt of flame from the tailpipe. "Just like the Demon King," as a colleague remarked.

The show lacked nothing. Surprise: sudden sunlight filtering through a hole in Saturday's cloud when it was punctured by

MAMBA POWERED AIRCRAFT FOR THE ROYAL NAVY

THE SHORT SEAMEW

New Anti-Submarine Aircraft

By a Student of the Air

The Short Seamew A.S.1 anti-submarine aircraft is removed from the Air Ministry's secret list this morning. It is a highly simplified aircraft with fixed undercarriage, extremely light in weight, and reduced to the fewest number of essential components. The engine is an Armstrong Siddeley Mamba turboprop.

The new Short Seamew was designed by Mr Keith Lucas, and the period between the original conception and the first flight has been exceptionally brief. In some ways the new machine follows the theory which has already been put forward in favour of light-weight fighters. It employs fewer men and less materials in production and is, therefore, cheaper, whether the cost be regarded in pounds sterling or in man-hours and raw materials. It is also thought that its light weight and general handiness may be of assistance in ship-borne operations.

The Manchester Guardian
September 1st, 1953

ARMSTRONG SIDDELEY **MAMBA** TURBOPROP

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FARNBOROUGH'S FULL WEEK . . .

the Olympus-Canberra. Colour: from trim white tops to gaudy Boulton Paul yellow or Swift blue. Acrobatics: swallow-diving, rolling jets, the spinning Provost and the superb clowning of Porteous in the tumbling Aiglet. Humour: the Beverley reversing as in some grotesque ballet. And a grand finale: the parade of Avro deltas, which now seem characteristically British in form as well as colour, and the Princess—beauty on a grand scale, in silver, gold, white and royal blue. Truly a great display, to the British public the greatest air show on earth.

SIGHTS AND SOUNDS

BEFORE we write more of the aircraft and the flying—adding to and amplifying last week's account—it may be profitable to interpolate a brief word-picture, for the benefit especially of those who for various reasons have never had the good fortune to attend an S.B.A.C. Show.

Year by year this outstanding event in British aviation has been acquiring an atmosphere, an essence (though totally dissimilar in kind) comparable with that which distinguishes all great occasions: Test matches, the Derby, Wimbledon tennis, the Le Mans race.

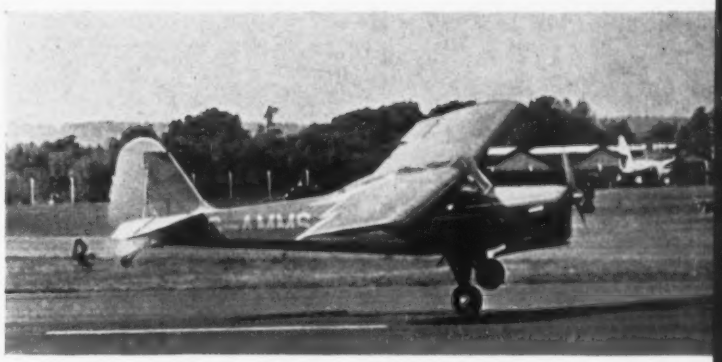
Indefinable, compounded of countless different sights, sounds and smells, this year it was more pervasive than ever—especially so on one of those brilliant days early in the week. You first sense it just within the gates, where R.A.F. police, blanco-gaitered, sternly wave the long lines of cars into the right channels—those dusty fenced-off lanes meandering through the purlieus of the Royal Aircraft Establishment, a hinterland of sad, tatty little buildings set down haphazardly among weed-choked plots that are the last resting-place of rusty cisterns, ancient test-rigs, oil-drums, lengths of ventilation-ducting, bits of airframe structure, nameless objects that might be anything from stovepipes to athodyds. Here, "By permission of the Stores Officer", the R.A.E. may dispose of its lost causes; there, under trim earth mounds improbably equipped with lightning conductors, it may ("No Smoking") store its explosives. For what, and how often, one speculates, does the Establishment use explosives?

And, speculating, you presently find yourself parked upon a hillside overlooking a sun-shimmering sea of marquees, caravans and flags receding in tiers to a distant amphitheatre where mirror-polished airframe surfaces dazzle and quiver; where the runway, trimly grass-bordered, stretches away westward towards Laffan's Plain (redolent name to aviation's greybeards!), the sodium-lights gleaming golden even in this silver sun-bath.

And how odd are the little contrasts that meet the eye! Here, flanking the President's Tent, a neat lawn and massed hydrangeas, oasis-like in a parched desert of sandy grass and rusty war-time P.S.P. tracking. Sleek black saloons waiting chauffeur-attended; a battered 20-year-old motor cycle. And the people, 99 per cent male on this guest-day, have been reduced to a common denominator by the blazing sunshine: Savile Row jackets and Bond Street bowlers have been shed into cars; Air Commodore Sir John Blank, retd., wearing a paper hat engineered from that morning's *Times*, shares shirt-sleeved anonymity with test-bed observer Bill Jones.

Stroll between the long lines of trade caravans on the hillside, each with its Coronation-style name-banner and little fenced-off garden, where the clink of glasses mixes gaily with chatter and laughter, and you realize why Show Week is so much looked forward to as a reunion of friends in the industry; you detect it again in the static show, though in the crowded aisles between the stands (where the close air is scented with that amalgam of rubber, linoleum and tobacco-smoke characteristic of all trade exhibitions) there is a more workaday feeling. Here, too, one notices the Continental visitors, earnest-faced, brief-case-bearing, with Leicas at the ready; or perhaps a light grey suit, a tie like an explosion in a wall-paper factory, and a friendly Western voice.

Outside, as flying-hour draws near, a hush seems to fall, though it is felt rather than detected by the ear. (You can sense it at a car race, when the drivers begin to take their places on the starting-grid.) Then away on the far side, where the R.A.E.'s main buildings stand starkly black on the skyline, there are the muffled bangs and brief rocket roars of cartridge starters; a piston-engine bangs and belches, the whine of a turbine rises to a shrieking whistle and dust-storms play through the parked aircraft. Near at hand, penetrative through the roar and rumble, comes a metallic voice: "Good afternoon, everybody. In about ten minutes' time . . ." The big show is on.

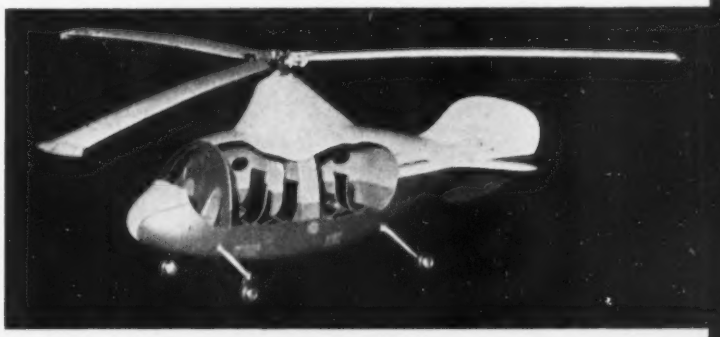


Playful as ever—the Aiglet Trainer, Porteus up.

TRANSPORT DAY

IT was, of course, inevitable that the Thursday flying programme would be less spectacular than those of other days; and possibly the number of people who stayed away, fearing to find transport aircraft comparatively dull, was increased by the chilly greyness of the weather that afternoon. Whether or not the idea proved successful enough to repeat at future shows remains to be seen. It certainly provided many of the most heavily stressed pilots with a welcome break, and made it easier for those visitors whose real business at Farnborough lay in the static tent to restrain the temptation to dash outside every few minutes.

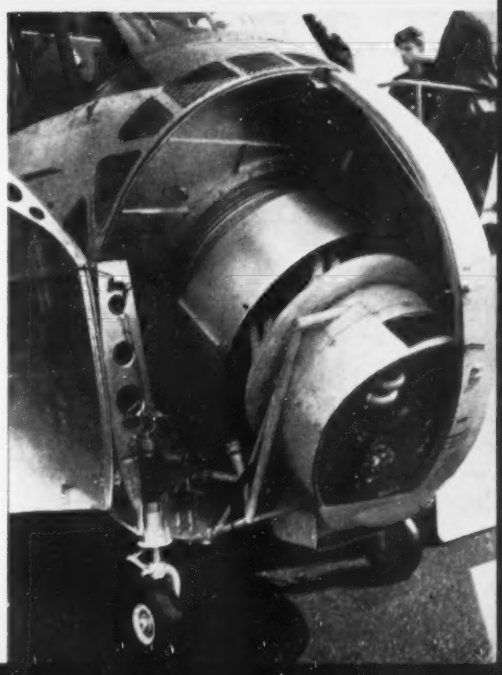
Two of the most effective performances were given by the Blackburn and Bristol freighters. The Beverley took off with what was described as the heaviest load ever lifted by a British aircraft: two seven-ton Bedford lorries (and, literally, a kitchen sink). A Silver City Superfreighter took a day's holiday from its normal work on the Channel ferry to show how the combination of a good aircraft and deft operating technique has produced one of the most effective short-haul transport operations in the world. It took off, flew round and landed with a vehicle

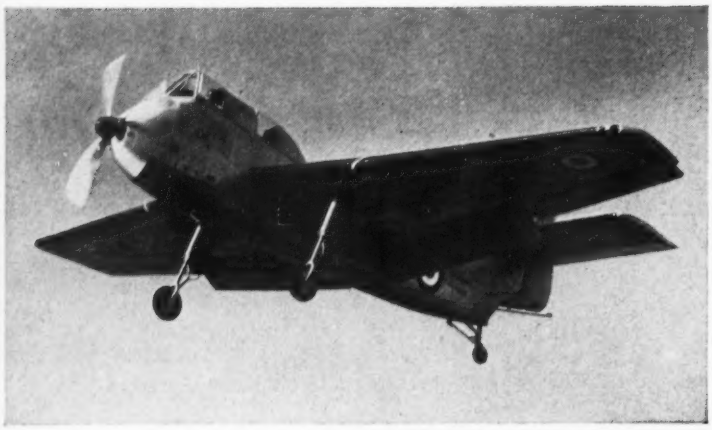


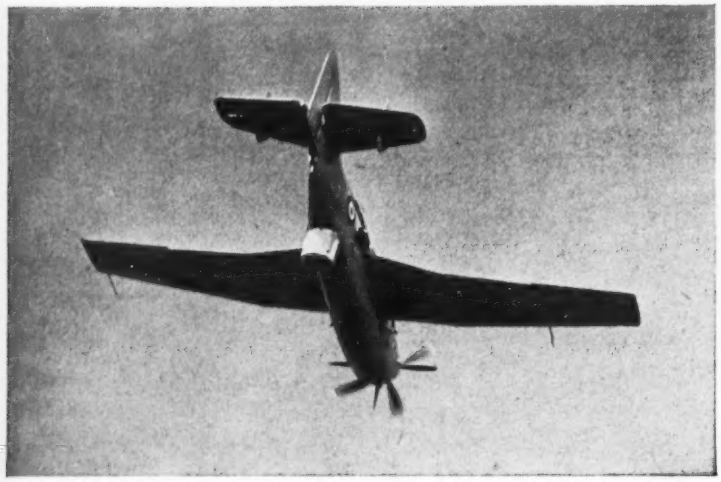
(Above) Model of the Percival eight-seater helicopter, briefly described on this page.

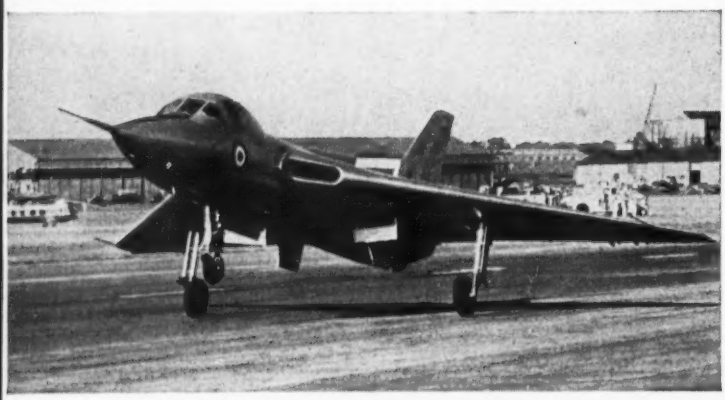
(Right) Installation of Alvis Leonides power plant in the Westland-Sikorsky S-55 helicopter.

(Below) Experimental development of the Westland Sikorsky Dragonfly with four-bladed rotor.









FARNBOROUGH'S FULL WEEK . . .

load consisting of a Land Rover and Vauxhall and Bristol cars, and the time of unloading—from engines stop, doors open, to doors close, engines start—was only 1 min 39 sec. Both Viscount and Britannia were demonstrated on partial power, as illustrated on page 403 of this issue. The latter took off with one Proteus out of action but was observed to unstick in well under 20 seconds. The Pembroke's pilot stopped one of the two Leonides during the initial climb and on return showed off this snappy machine's asymmetric qualities by a single-engined overshoot. Both the Beaver and Pioneer were demonstrated with passengers aboard. The Bristol 171 went two better by flying first with freight (in the form of two large oil drums slung in a net container for easy pick-up); then as an ambulance with two stretchers; and finally with four passengers. The twin-rotor Type 173 gave a longer and rather more lively demonstration than on previous days; its angles of bank almost rivalled those of the spritely Skeeter. Westland's were represented by two versions of the S-51—a Naval Dragonfly and the red-and-cream civil demonstrator—which performed simultaneously. When the Skeeter, the smallest aircraft in the show, concluded its demonstration, it was the turn of the largest—the supremely impressive Princess which for some time had been orbiting beyond the fringe of trees to the west of the airfield. Tyson's low runs more than made up for any dull moments experienced earlier in the programme.

HELICOPTERS

ORIGINALLY displayed on the Percival stand, later removed and eventually restored, was a model of an 8,200 lb helicopter with a jet-driven rotor. A disposable load of 3,330 lb is claimed for this type, including eight passengers, whose chairs are arranged four forward and four rearward. The cockpit has dual controls and the power unit is located centrally in the floor. Air ducts feed up on each side of the cabin and their "boxes" are reminiscent of those which contain the wheels in the Short Sealand. The engine itself is a Napier high-efficiency, low-pressure gas-propulsion unit, inspired by a Percival design. There is no mechanical coupling whatsoever. A conventional fin and tailplane were shown on the model and the machine will, in fact, have an orthodox rudder; but at the moment Percivals have nothing to say as to elevators or horizontal trimmers on the tailplane. Already components are being whirled in a specially built test-pit at Luton.

References to the Bristol and Westland helicopters were made in our report last week, and some detail illustrations appear in subsequent pages of this review, together with a further note (p. 406) on the Bristol 173.

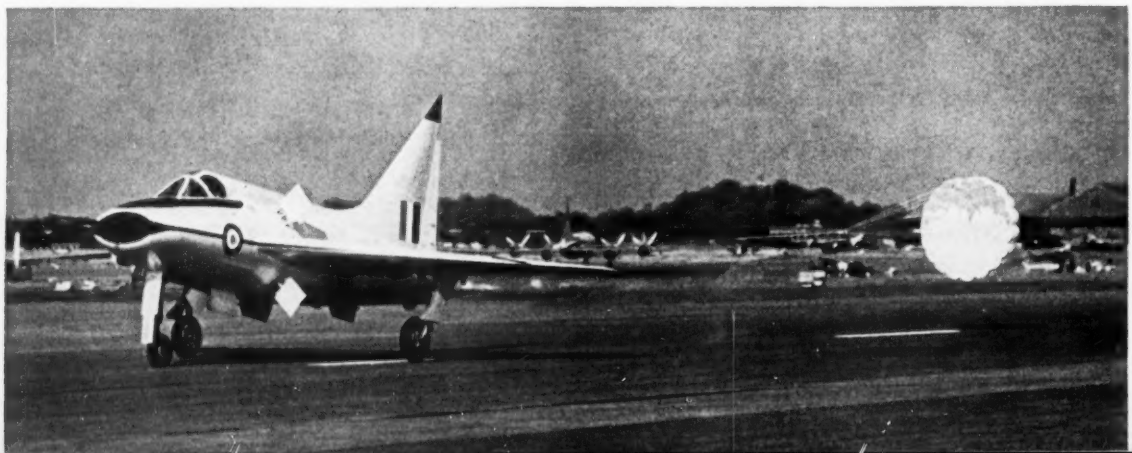
BOMBERS

BECAUSE of the immense design and production effort they have occasioned, as well as for their awesome military potentialities and the high promise of civil derivatives, the Vulcan, Valiant and Victor bombers are of cardinal importance to British aviation as a whole. Accordingly they were duly revered and sedulously studied at Farnborough.

The delta "circus" afforded the first opportunity for comparing the two Vulcan prototypes. These are almost indistinguishable in the air, but it was observed that the second—Olympus-powered—machine has redesigned air brakes, the action of which may be studied to excellent advantage, and compared with the earlier type, in pictures on page 404. The Vulcans have stick control for their great, powered control-surfaces.

Avro's Armaments Division showed their A.V.151 triple bomb-carrier, weighing about 42 lb and carrying three 1,000 lb bombs

The ample wing area and the flap arrangements on the Short Seamew are particularly well shown in the uppermost view. Successively are depicted a production Fairey Gannet; the Avro 707C, for delta familiarization; and the Boulton Paul P.111A delta-wing research aircraft, with its "petal" dive-brakes and arrester parachute in action.



Essentially new features of the Vickers-Armstrongs Valiant B.2 (four Rolls-Royce Avon RA.14s) are shown here; principal among them are the fairings for the retracted bogie undercarriage units and the lengthened nose. (Right) Breathtaking departure of Rolls-Royce's experimental Canberra, with Avon RA.14s. For angle of climb from take-off this flying test-bed was unsurpassed at Farnborough.

measuring 16.5in to 17.8in in diameter. Something of the sort might be applicable to the Vulcan, though more potent weapons than the familiar 1,000-pounder—bombs of the atomic and/or guided variety—are, of course, in prospect. Avros also exhibited their single-cell flare chute for stores up to 6in in diameter and 40in in length.

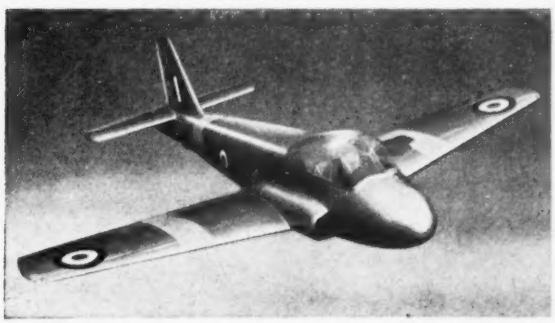
The glossy-black Valiant B.Mk 2 looks even more impressive in the air than the silver-finished B.1, in spite of the growth of trailing-edge fairings for the new rearward-retracting twin-four-wheel-bogie main undercarriage (and perhaps for a pair of Super Sprites?). Its nose is several feet longer and somehow balances the massive fairings in an aesthetic sense—as it must do in respect of c.g. position. The Avons are RA.14s and these, together with the new undercarriage, should allow operation at far greater weights than formerly. The saving of wing-space by the new undercarriage arrangement will doubtless enable a useful quantity of additional fuel to be carried in the wing; even so, under-wing drop tanks (as are likely to be carried by the Valiant B.1 when it competes in the New Zealand Race next month) would probably be fitted for ultimate range. The keener eyes spotted what appeared to be a panel of Fibreglass just forward of the tail cone under the fuselage, and there are two round objects, which might be camera ports, likewise in the bottom skin approximately in line with the leading edge.

For the record, the prototype Valiant B.2 made its first flight from Wisley on September 4th. The pilot was G. R. Bryce; with him were Brian Trubshaw and flight-observer G. R. Holland.

The Victor—the first production version of which was illustrated in model form last week—flew very strongly on the power of its four Armstrong Siddeley Sapphires. The makers claim that a particular virtue is the ease of take-off and landing, and that it is possible for the pilot to set the machine down with hands off the controls—as was to be demonstrated later at Radlett.

The demonstrated rate of climb of Rolls-Royce's experimental Avon R.A.14-powered Canberra was steeper even than that of Bristol's record-breaking, Olympus-powered, machine. The undercarriage of these high-thrust Canberras must, of course, be tucked in immediately the wheels have unstuck. This can readily be understood when it is known that the unstick speed of the Olympus-Canberra is 120 kt and that the maximum speed for flying with wheels down is 180 kt—representing only a few seconds' acceleration. At sea level, incidentally, the Olympus-Canberra has a speed range of something over 400 kt between the limits of stalling speed and critical Mach number. Bristols point out that there can be few aircraft in the world other than this in which the rate of climb is such that the critical Mach number is the limiting factor.

Revised intakes and bubble canopy on the Percival Jet Provost model.



ANTI-SUBMARINE AIRCRAFT

THE Naval aircraft-of-the-year was, of course, the Mamba-powered Short Seamew A.S.1, which won much praise for its practical features and surprisingly lively performance on a single Mamba. It is intended that these machines should be available in large numbers for the protection of any sort of convoy, for the types can operate from both escort and merchant-ship carriers.

Good news was forthcoming concerning the Fairey Gannet (Double Mamba). No. 1 production aircraft, as demonstrated, appeared from the Hayes factory in June, whereupon it was taken by road to London Airport and flown to White Waltham. In succession, Nos. 2, 3 and 4 had, more than a month before the opening of Farnborough, moved on to final assembly.

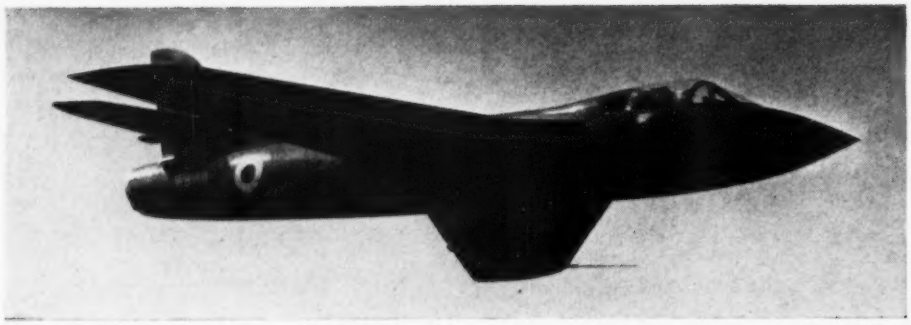
Faireys' incidentally, have taken over a large hangar on the north side of Northolt from B.E.A., and here one of the final-assembly lines is in "progressive action".

Rumours link the shore-based Avro Shackleton—not illogically—with Napier Nomad compounded engines.

OTHER MILITARY TYPES

THE following snippets of news concern some aircraft of diverse function and size:

It has occurred to some people that one of the biggest obstacles confronting the Princess or Princesses is their requirement for pairs of Coupled Proteus which do not exist, in which, in view of their many other commitments, Bristols would presumably be reluctant to build. But, taking advantage of the increased power



An unusually well-defined high-speed impression of the record-breaking Hawker Hunter F.1, with reheat Avon of unspecified type.

FARNBOROUGH'S FULL WEEK . . .

of the latest Proteus, might not the Saunders-Roe Princess be powered with six of these units in place of the present ten? It would still have an excellent range and payload for troop transportation, and fuel requirement would be less, thus permitting a lower all-up weight for such duties.

Something approaching airline standards of comfort are afforded by the C.I. version of the Pembroke, to operate the R.A.F. in the communication role. The eight rear-facing 15g seats are adjustable and embody arm-rests and winged head-rests. Writing tables may be fitted into the arm-rests.

As might be supposed (though to the best of our recollection the fact has never before been publicly mentioned), the Westland Wyvern S.4 is capable of carrying three mines. A fast, low-level mine-layer could prove invaluable, especially so as, without extra tanks the Wyvern is claimed to fly about four times as far as a contemporary day fighter.

FIGHTERS: THE NEW GENERATION

WITH the appearance in Korea of the Mig-15 and subsequent engagements between these aircraft and F-86s, jet-fighter combat became a reality. It was a severe shock to many to find firstly that in all the Western world there was only one fighter in service which could do more, without good luck, than escape unharmed from the Mig-15; and secondly, that the well-tried bomber-protection techniques evolved during World War II were no longer effective against already-existing bomber-destroying fighters. B-29 gunners operating in daylight over Korea found that even their closely interwoven patterns of cross-fire could not be set up in time to deter a near-sonic stern attack from Mig-15s. They therefore switched to night operations—in which they were, however, further exposed to night-fighter attacks. It is true that both Sea Furies and F-84s successfully engaged Mig-15s in Korea, but their successes were not due to their performance in respect of speed or climb.

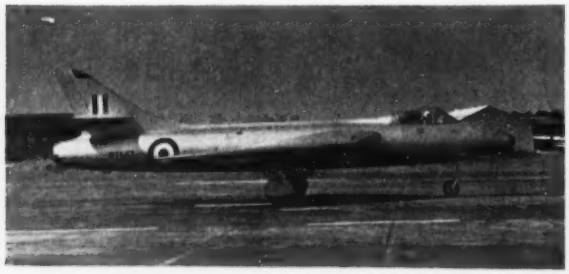
The whole question of fighter development has now become one of dire urgency. A new generation of both day and all-weather fighters is immediately required in squadron service; the Meteor and the Vampire, on which the burden of defence has hitherto rested are now outclassed in view of the arrival of the new high-level bombers.

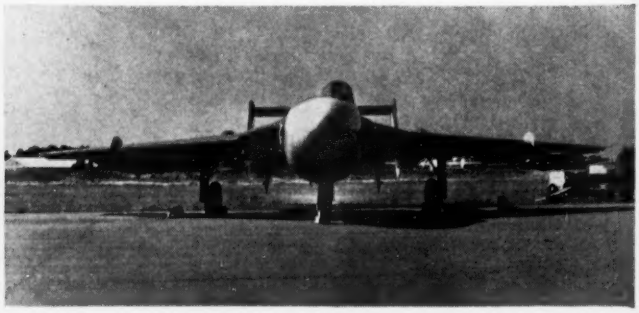
At Farnborough this year early-production versions of the new generation of fighters have appeared, and squadrons of Swifts and Hunters are to be formed within weeks or months. By reason of their very high performance their introduction into service will mean a considerable revision of operating techniques. From inspection of these aircraft some impression could be formed of the new procedures which they will require. No details of actual performance have so far been released, but it is clear from events at Farnborough that speed, acceleration, climb and ceiling are in a new class. This must mean that, from the pilot's point of view, fighter flying will change; new controls and new "gadgets" will be added. In general, however, the trend appears to be to simplify control and procedures.

Both the Swift and the Hunter have only one engine, cartridge-started, as compared with the Meteor's two, with externally assisted electric starting. This means that the "scramble" will be quick, but the pilot must still make approximately 13 assorted connections between himself and the aircraft. These can be made in a time equivalent to that taken to start the Meteor's engines; but the new fighters' cartridge starting is very much quicker and no trollies have to be cleared away. The pilot, moreover, will have to put on g-suit, plastic helmet, possibly a pressure-breathing waistcoat, and a Mae West fitted with rescue-beacon equipment; and all this may render prolonged readiness uncomfortable. He will enter the Hunter by ladder and the Swift by recessed steps on the right of the cockpit. Once taxying out, his task will be simpler. Take-off, acceleration and climb will be very much faster than at present, and the pilot's sitting posture more comfortable. Take-off distance of both Hunter and Swift appeared at Farnborough to be equal to that of the Meteor. Undercarriage retraction was also appropriately rapid.

High-level operation will show a great improvement over that of the Meteor. Cabin pressurization, refrigeration and heating, as well as the lightness of the powered controls and the acceleration afforded by reheat will allow comfortable battle-formation at height. Visibility, at least on the Hunter, is vastly improved, and both Hunter and Swift are fitted with rear-view mirrors under the windscreen frame. Tailplane trim on both types is adjusted with a finger-tip control. Both aircraft also demonstrated their high rate of roll, and all these factors should render them very pleasant fighting types. The new 4 x 30 mm cannon armament, with radar-ranging gunsight, will give them a punch much superior to that of the Meteor. It is perhaps notable in passing that nose-mounted gun cameras appear to be standard.

Reading clockwise, the third production Hunter F.1; the D.H.110 prototype under development for the Royal Navy; the third prototype Javelin; and the version of the Swift announced as the F.3. A wide-track undercarriage is a feature of all four.



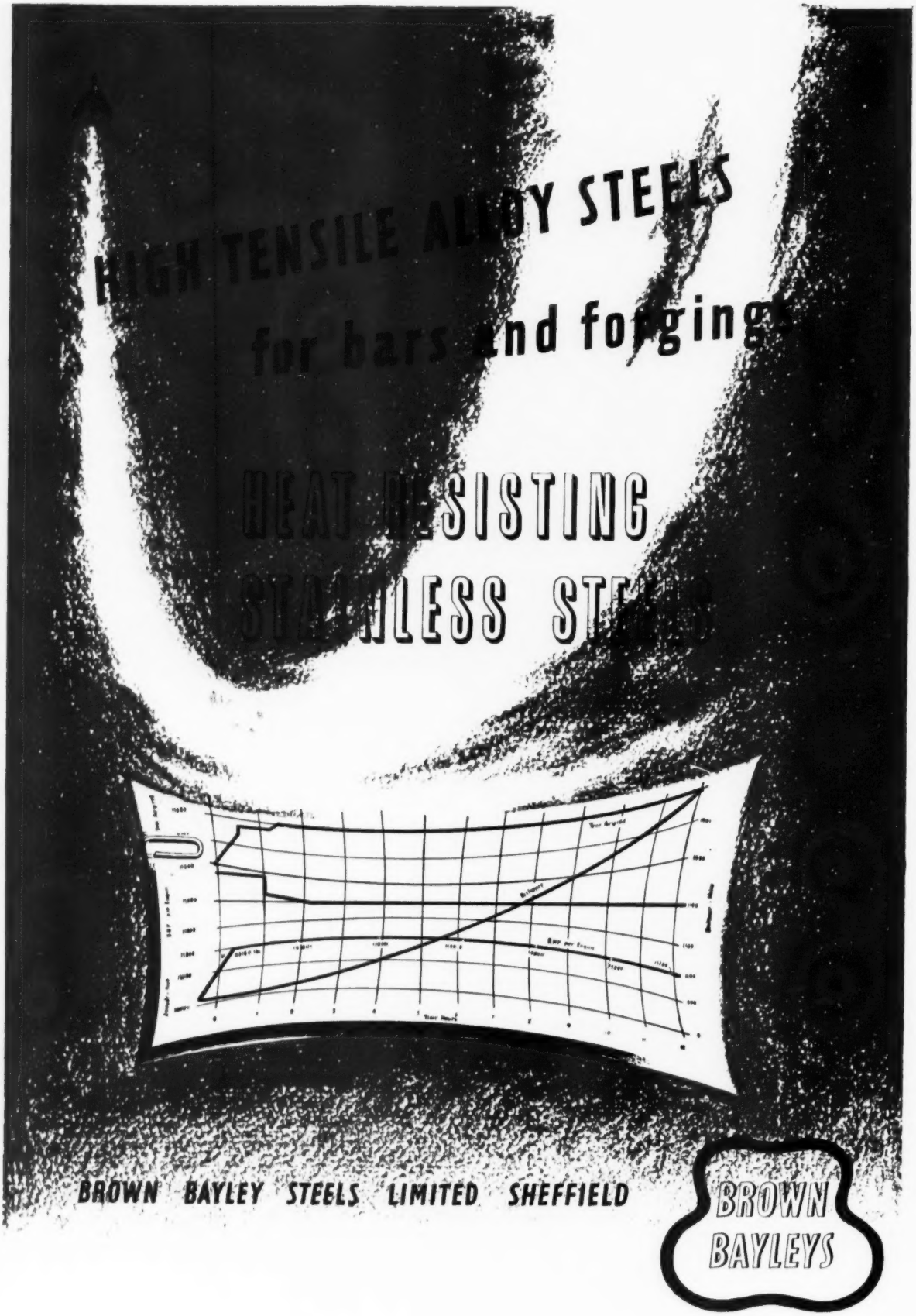


ROTOL

on the Gannets

Rotol eight blade co-axial propellers and accessory gearboxes, are exclusively specified for the Fairey Gannets in super priority production for the Royal Navy and the Royal Australian Navy

ROTOL


HIGH TENSILE ALLOY STEELS
for bars and forgings
HEAT RESISTING
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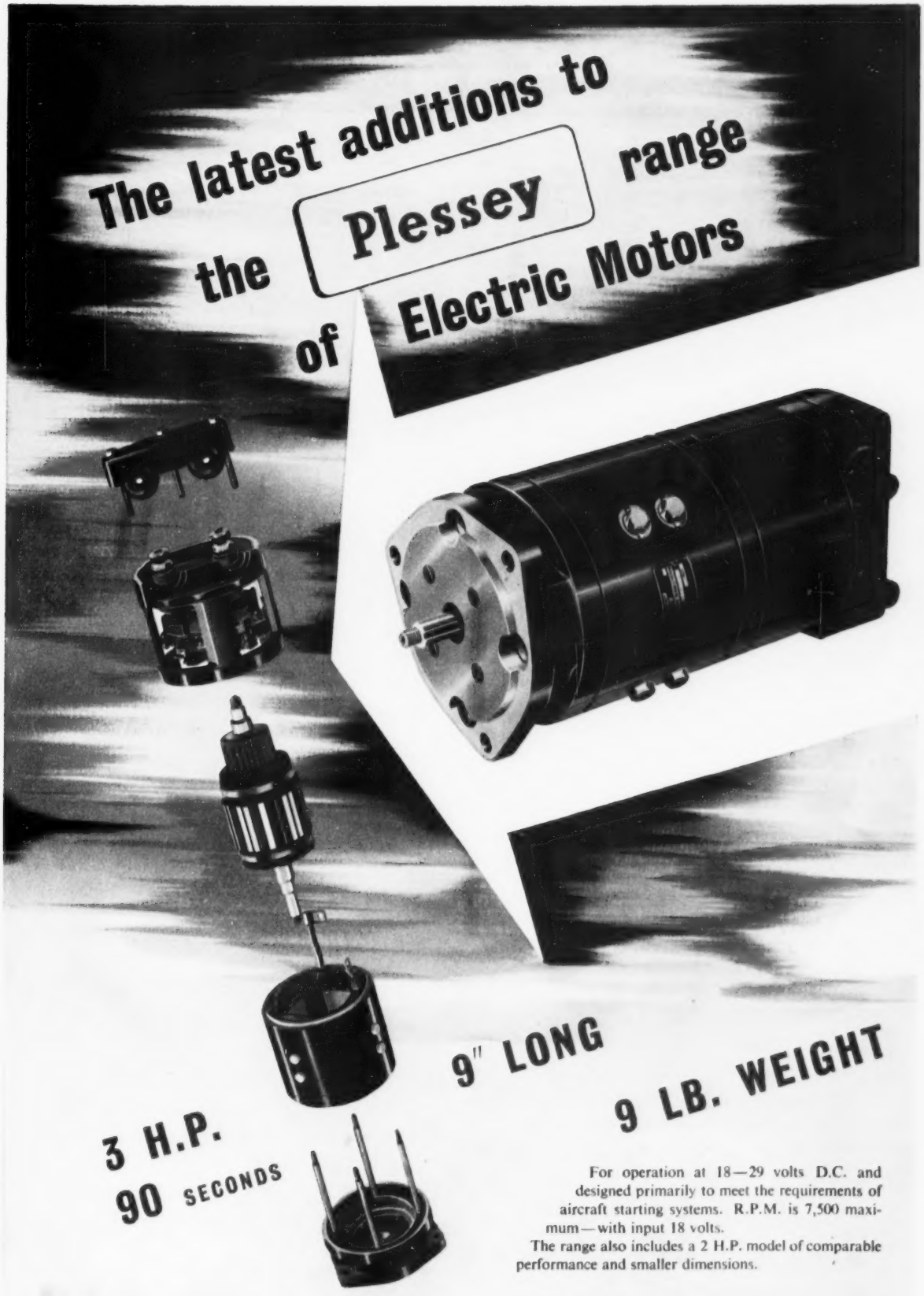
The latest additions to the Plessey range of Electric Motors



3 H.P.
90 SECONDS

9" LONG
9 LB. WEIGHT

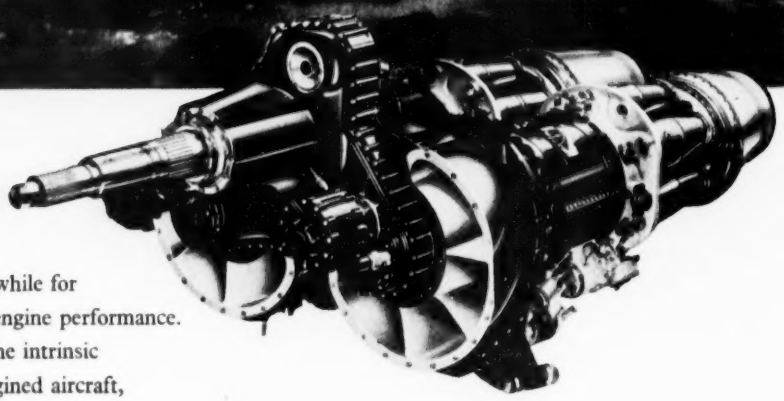
For operation at 18—29 volts D.C. and designed primarily to meet the requirements of aircraft starting systems. R.P.M. is 7,500 maximum—with input 18 volts.
The range also includes a 2 H.P. model of comparable performance and smaller dimensions.

PUMPS · VALVES · AIRCRAFT STARTERS · PREFORMED WIRING SYSTEMS · ELECTRIC ACTUATORS
THE PLESSEY COMPANY LIMITED · ILFORD · ESSEX

AC32

ATTACK IS THE SUREST DEFENCE

Death to the lurking submarine — carrier borne Fairey Gannets patrolling far from the convoy seek out and destroy the enemy before he can close to striking range.

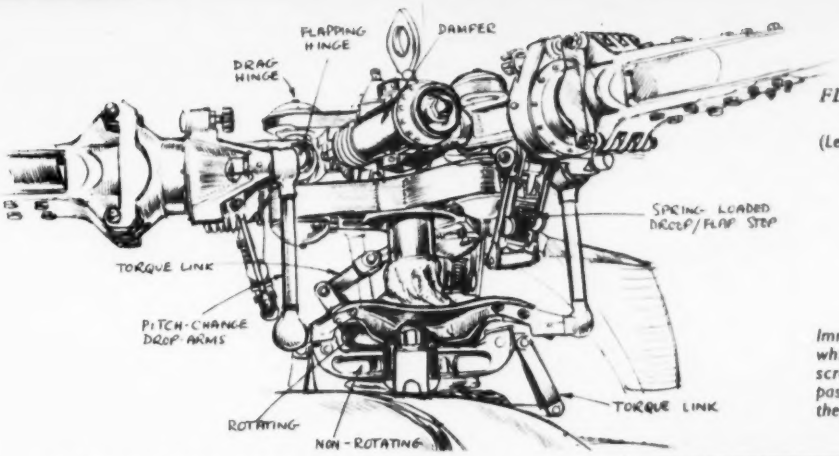


The Gannet owes its long range to the Armstrong Siddeley Double Mamba turboprop; cruising with one engine shut down the fuel consumption is comparatively low, while for attack with both engines the Gannet has full twin engine performance. Aircraft equipped with the Double Mamba have the intrinsic stowing and fuel economy advantages of single engined aircraft, with the safety factor and power potential two engines provide.

THE DOUBLE MAMBA TURBOPROP

Two engines in one for the anti-submarine Fairey Gannet—Super-priority for the Royal Navy and the Royal Australian Navy

ARMSTRONG SIDDELEY MOTORS LIMITED · COVENTRY *Members of the Hawker Siddeley Group*



(Left) Centre of interest: Rotor-head assembly of the Westland-Sikorsky S-55.

Immediately below are seen the Britannia (top), which took off with one of its D.H. steel airscrews feathered; an Air France Viscount 708 passing by on starboard Dart-power only; and the futuristic Bristol 173 with its new lift surfaces.

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and dive-brake and powerful new wheel-brakes. Although touchdown speeds appear to be somewhat higher than that of the Meteor, these new brakes—the Swift at least is fitted with Maxaret skid-preventing brakes—will allow a comfortable landing to be made on the normally accepted 2,000-yd runway.

From the servicing point of view the Hunter and Swift may present some problems, because the extremely smooth and clean outline of the aircraft will have to be protected from damage and grit, and because the engines and equipment will, by reason of the clean design, be rather less accessible.

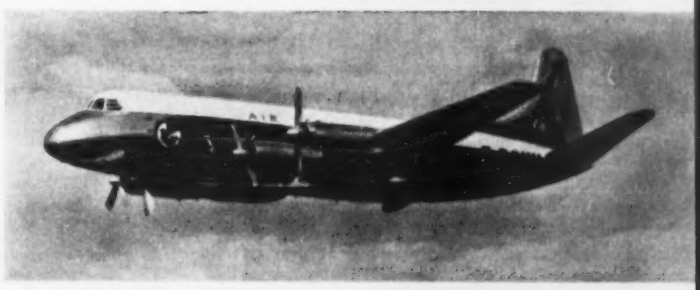
This particular problem applies equally to the two all-weather fighters, the D.H.110 and the Javelin, which represent the new generation of all-weather intercepters. The first noticeable feature of each is its impressive size. With all-up weight probably approaching that of a fully loaded Dakota, and a design in each case by no means conventional, they will initially present some entirely new problems to the night-fighter pilot. The type of radar carried is much larger than has hitherto been employed for this purpose, and it is also possible that new systems will be used. The D.H.110 is subject to the very stringent Naval requirements for carrier operation and though not fitted, as yet, with guns or arrester hook, it already carries an impressive flap area. It seems possible that it will be developed from the beginning to carry an armament solely of guided missiles, while the Javelin, on the other hand, is already fitted with four large-calibre wing-mounted guns. A noteworthy point is that, though the D.H.110 is entered from either side with the aid of a ladder, the Javelin crew mount *via* steps recessed in the port side of the jet-pipes abaft the wing, and walk the length of the fuselage to reach the cockpit. The time required for turn-round or scrambling, in the Javelin, must be somewhat greater than that required for a Vampire N.F.10 or a Meteor N.F.11. But, because of its great wing area, the Javelin offers, apparently, lower take-off and landing speeds than Hunter or Swift (and consequently shorter ground runs), with a manœuvrability at altitude which would be acceptable in the single-seat intercepter class. Performance of the D.H.110 in these respects is difficult to assess, because it may be considerably developed for Naval requirements—its landing speed as seen at Farnborough was, one felt, somewhat high, even for an angled deck.

In the final analysis, however, the introduction of the new generation of fighters appears to present no insuperable problems from the pilot's point of view. Really "futuristic" innovations will almost inevitably be made by the generation after next, as could be gathered from Fairey's static-show model, presumed to represent a vertical take-off intercepter.

AIRLINE ASPECTS

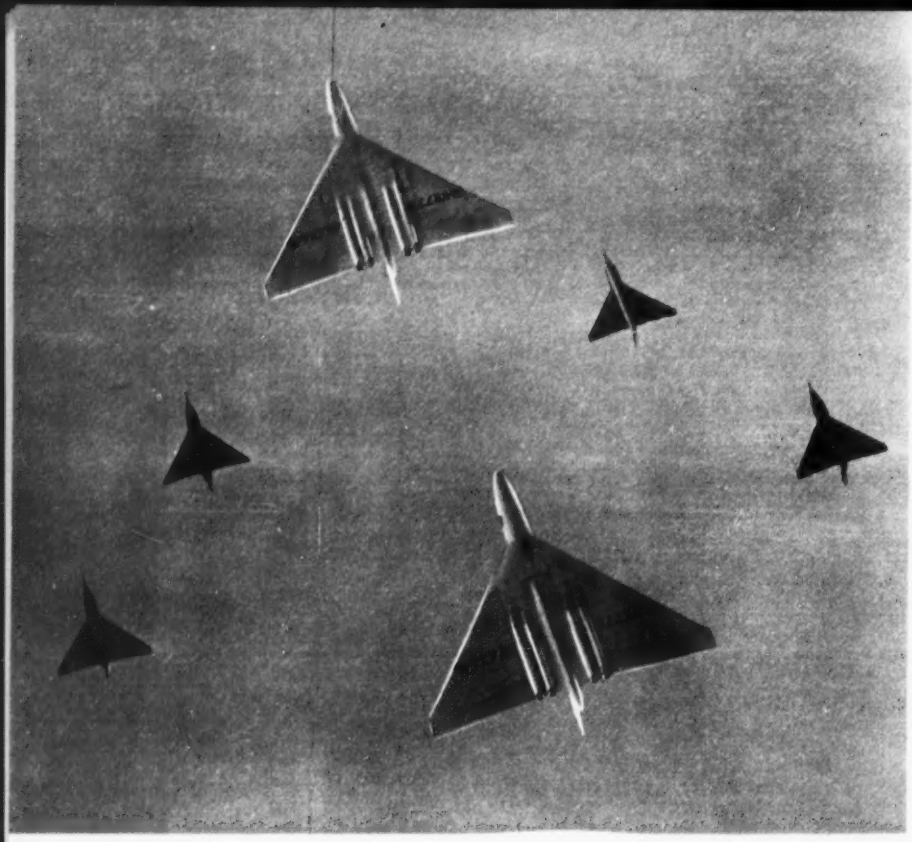
FROM the commercial operator's viewpoint, the value of an S.B.A.C. Show cannot be measured in terms of the numbers of new aircraft displayed. Most of the machines exhibited this year have already been seen at earlier stages of development, but

(*Continued on page* 406, *after double-page of Farnborough photographs.*)



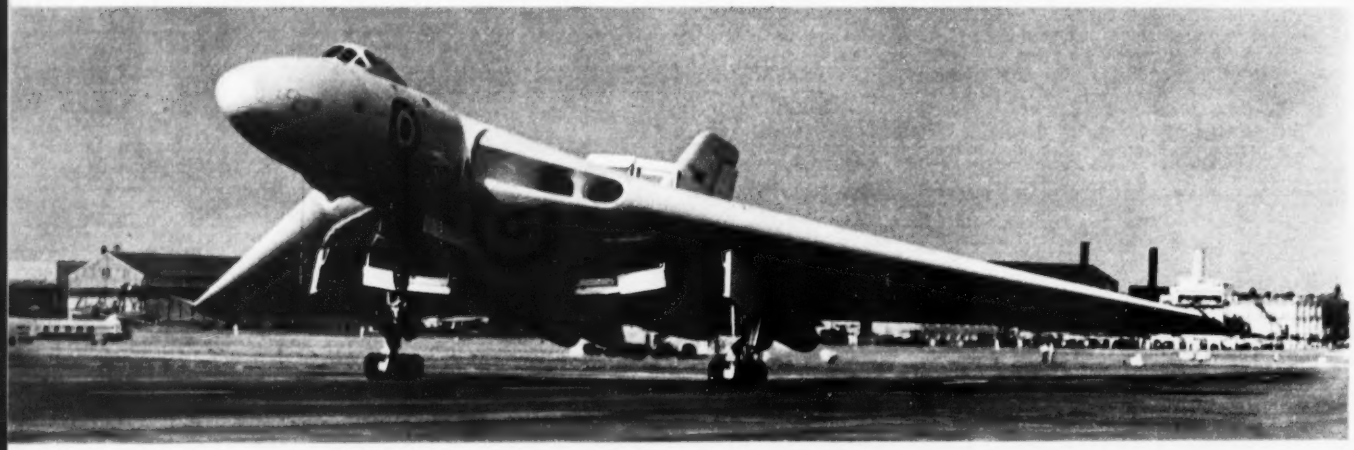
An Air France Comet 1a "stood in" for the Comet 2, which was unable to appear; it was undergoing routine inspection after initial trials

Ground-to-Air and Ground-to-Ground



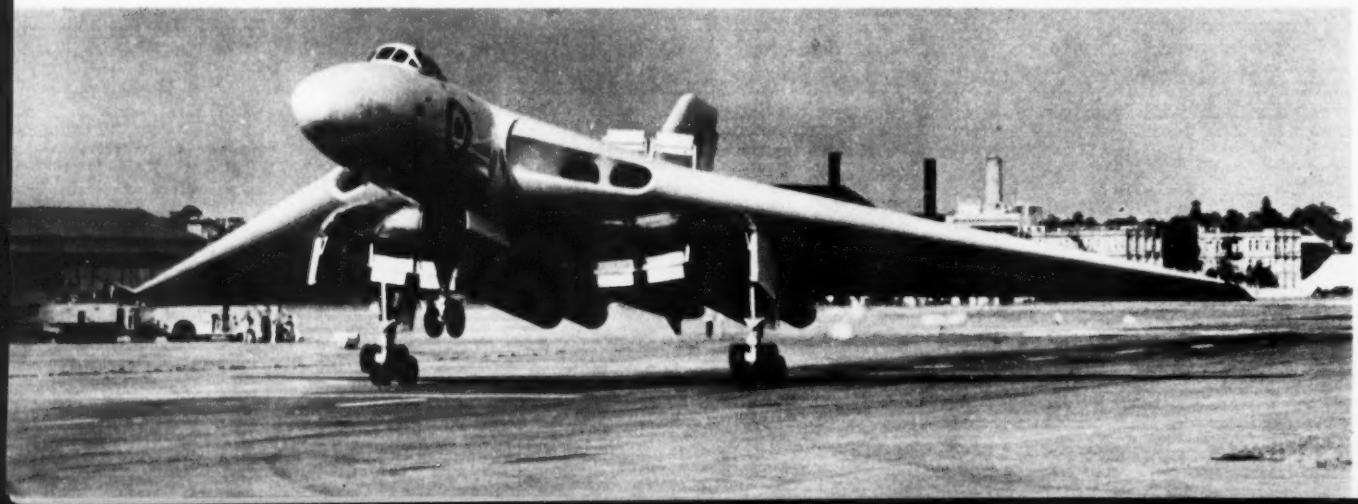
The trigonometrical formation of varicoloured Avro deltas—a significant and beautiful spectacle.

Blades and wings: the Bristol 173.

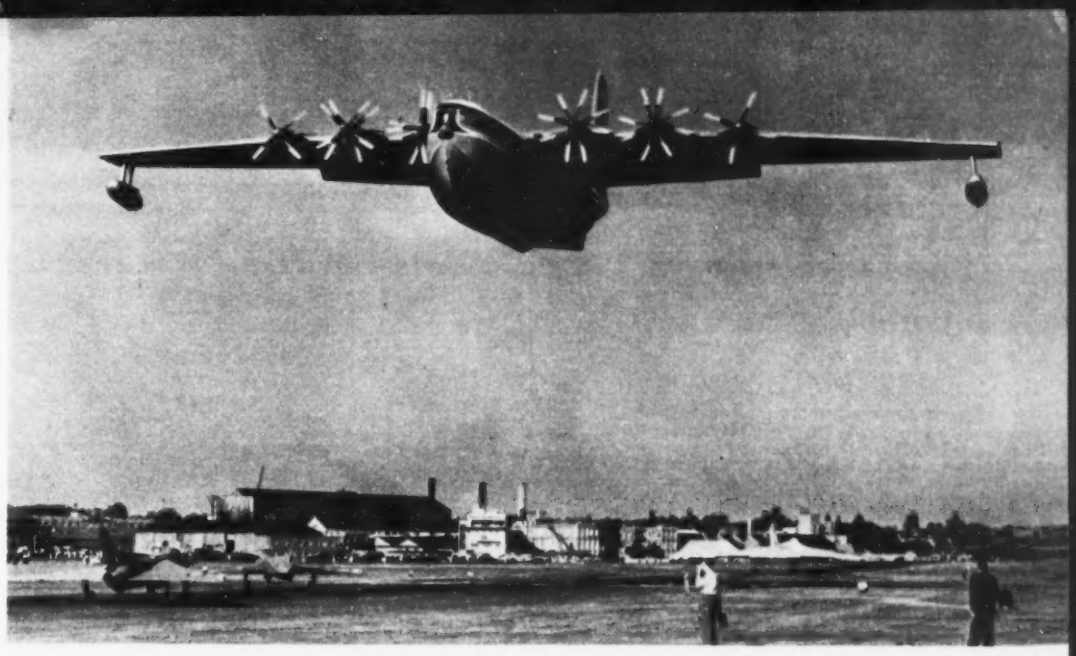


Second prototype of the Avro Vulcan B.1. Compare the action of the dive brakes with those below

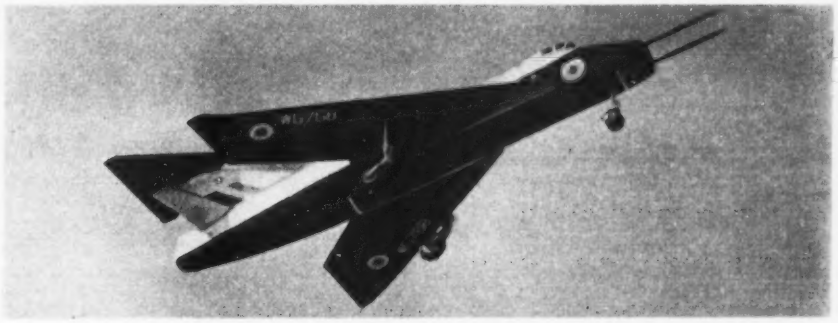
First prototype of the Vulcan B.1. Unlike the second machine (above) it has no under-nose blister.



More "Flight" Photographs from the Show



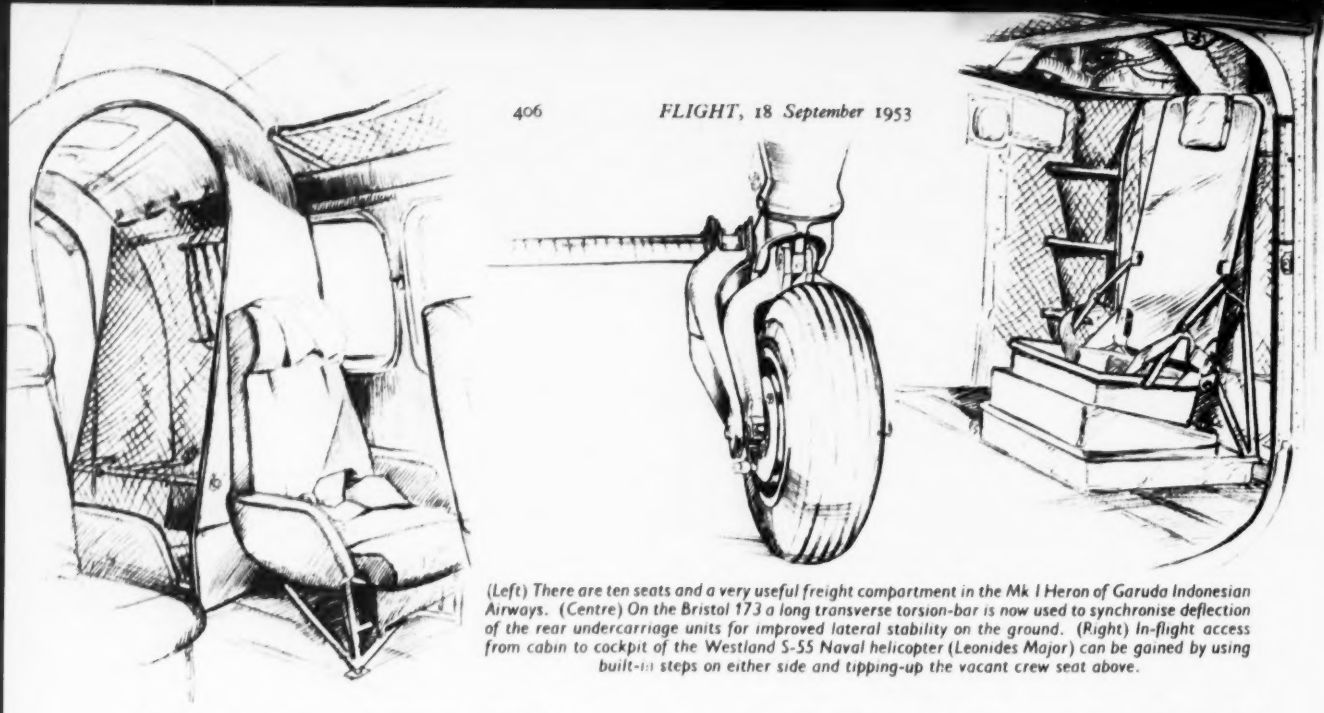
Finished in a paint-scheme befitting her regal grace, the Saro Princess stoops to conquer.



What fantastic supersonic aircraft, people were asking, will be built in the light of experience provided by Short's S.B.5 adjustable-sweep research aircraft?

The Vickers-Armstrongs Valiant B.2, showing the new lengthened nose, and fairings for the rearward-retracting bogie undercarriage.

First prototype of the Handley Page Victor B.1. A statically displayed model shows a version with a longer, smoother nose and revised tail.



(Left) There are ten seats and a very useful freight compartment in the Mk I Heron of Garuda Indonesian Airways. (Centre) On the Bristol 173 a long transverse torsion-bar is now used to synchronise deflection of the rear undercarriage units for improved lateral stability on the ground. (Right) In-flight access from cabin to cockpit of the Westland S-55 Naval helicopter (Leonides Major) can be gained by using built-in steps on either side and tipping-up the vacant crew seat above.

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the fact implies no slackening of the industry's interest in the civil market. As the world knows, this interest has never been greater, and the present sales drive is bringing satisfactory results. The working life of a good commercial aeroplane can be anything up to—in some cases, beyond—ten years, so there is no call for an annual crop of prototypes.

What the operators *must* have is a reasonable selection of basic designs, up-to-date, reliable and economical, with the assurance that orders will be fulfilled punctually. Farnborough indicates the extent of the efforts made by the industry to meet present requirements, and expresses the technical approach towards the operators' future demands. Much is achieved on the spot in direct discussion between maker and operator—but the eventual results of these personal contacts will obviously transpire in future rather than present Farnborough reports.

Most of this year's full-size civil aircraft, and many of the models, were shown in airline colours—a means of improving their appearance and also of reminding observers that British airlines are not the only ones to fly our new aircraft. Both Comet and Viscount wore the distinctive livery of Air France, and on the Heron were seen, for the first time in this country, the colours of Garuda Indonesian Airways. All the airlines to have ordered Comets were represented by models on the D.H. stand. One looks forward to seeing a Britannia at the next "Farnborough" with the markings of Qantas, or, perhaps, one of the other customers whose order has yet to receive the final signature.

Pegg's urbane demonstration of G-ALBO, the first prototype Britannia, confirmed our last year's impression that this must be the quietest large airliner in the world. Its take-off gives the aural effect that the new Proteus 705s are at idling speed, and it flies overhead with a gracious purr which complements the shapeliness of the airframe. This feature of the Britannia may not yet be fully appreciated; although it is convenient to ignore the airport-noise problem, events in America suggest that it would be unwise to do so indefinitely. In the static tent, a 1/24th-scale model showed the even-better proportions of the lengthened Britannia 300, with six-abreast seating for up to 104. The manufacturer's new journal, *The Bristol Quarterly*, reveals that orders for 12 Britannias are under negotiation, in addition to the 38 firmly or provisionally ordered by B.A.O.C. and Qantas.

Another stretched airliner, the Comet 3, was shown in model form in "the big tent". We learned on the Wednesday that the first Comet 2 was back in the hangar for the normal check after initial flight trials had been completed satisfactorily—trials which, to the regret of Farnborough-goers, prevented the aircraft from taking part in the flying display. The "two-day stand" by the first Air France Comet 1A (F-BGNX) partly compensated for its absence. The tremendous success of the Viscount as a medium-stage, mainline type largely accounts of the lack of other exhibits in this category. When the Viscounts eventually become obsolete replacement will be effected with larger turbine-powered aeroplanes or with helicopters—depending on the routes involved, and the success achieved with the big rotorplanes now under development. Commercially, such aircraft are still some years away, and the amount of information given about them was naturally limited—sometimes for security reasons. Percival were to have shown their helicopter project, but the model was taken off the stand, at M.o.S. request, just before the show began. Neither was Bristol's response to the "Bealine Bus" specification revealed. Models of both the Fairey Rotodyne and the big Saunders-Roe helicopter were shown.

Of more immediate interest to the airline man, since it is the forerunner of the first twin-engined helicopter adopted for passenger service, was the stub-winged version of the Bristol 173. Although the wings were only recently added, its performance was encouragingly stable, and the modified helicopter is reported fully up to expectations. The Mk 3 version for B.E.A. will be a 16-seater with two 850 h.p. Leonides Majors and increased cruising speed, whereas the two existing prototypes are 10/13-seaters with 545 h.p. engines.

The Show enabled a comparison to be made between various designers' approaches to the Dakota-replacement problem. In parentheses, one might reiterate that no new design can completely replace an aircraft which, normally acquired at an unrealistically low cost, is used for such widely differing purposes. Consequently, anything from a 16-seater to a 44-seater might, according to circumstances, be the answer to a particular Dakota-operator's prayer. There follow some brief notes on the new short- and medium-range transports—actual or projected—displayed at Farnborough.

Models of the Aviation Traders Accountant (a design, incidentally, which deserves a crisper title) certainly gave an impression of trim efficiency. The hinging-nose loading system would make the Accountant suitable for military and freight work as well as for the passenger rôle. Although of capacity comparable with that of the Heron and Twin Pioneer, the developed Bristol 173 cannot be directly compared with either, since it represents an evolutionary step towards a considerably larger machine.

The Heron, which has appeared a "natural" from the start, was shown with both fixed and retractable undercarriage. So far as can be judged, the two versions seem likely to remain in production for many years, and may even equal the success of the Dove, of which more than 450 have been sold. Reports from abroad suggest a potential market for Scottish Aviation's Twin Pioneer, which is designed to operate from small and rudimentary airfields. The helicopter, it might be argued, is better equipped for the same task, but the Scottish firm's design is based on the assumption that rotorplanes will for many years remain too expensive to buy and to operate on most out-of-the-way routes. Having completed initial design-studies on their P.87 36-seater, with two unnamed Napier turboprops, Percival Aircraft displayed its unconventional pusher layout for the first time at Farnborough. This is unusual among turbine-powered aircraft in that it is designed to give its economic best on short routes. Designer C. F. Toms permitted us a glance at the cost curve, which reaches its lowest at the 300-mile mark. Here, too, the importance of quick loading has been acknowledged—by the incorporation of a rear-fuselage ramp which folds downward to admit passengers or freight. By contrast, Handley Page have plumped for four piston-engines in their H.P.R.3—850 h.p. Leonides Majors, giving a cruising speed of 220 m.p.h. Standard tankage of 700 gallons will give a range of 1,500 miles. Models showed the disposition of seats for 36-44 passengers, or mixed loads of freight. After an

ANTI-SUBMARINE

For service in the Royal Navy — Fairey Gannets will operate from Fleet and Light Fleet Carriers. The Gannet is the latest specialised anti-submarine aircraft produced in Britain.

FAIREY GANNET

FAIREY AVIATION

THE FAIREY AVIATION COMPANY LIMITED · HAYES · MIDDLESEX

The outstanding progress of British jet engines

IMAGINE a Comet airliner taking off from London one Monday morning early in September on a route that encircled the globe, a matter of 25,000 miles, occupying (with halts) under four days. Having returned to London, it sets off again on the same schedule.

Imagine this routine being maintained all through September and half of October until the Comet had flown ten times round the world, a total distance of 250,000 miles, as far as from here to the moon.

When the Comet came in to London Airport after the tenth circuit only then would its de Havilland Ghost jet engines be due for overhaul and, after being removed from the aircraft, they would be sent to The de Havilland Engine Company at Watford, where, at the present time, many Ghosts are being overhauled every week for airline service.

During the ten laps of the world the Ghost engines would need nothing more than the routine inspections of external parts and flame tubes, for which purposes the engines might be changed, but only for the sake of convenience, to avoid delaying the aircraft.

There is no other jet engine in the world which is being subjected to the rigours of airline operation. Military activity does not call for anything like the same prolonged and arduous service. The Ghost engine, which made the Comet possible, is now giving 600 hours (a quarter-million miles) of duty between overhauls, with extension trials to 750 hours already under way.

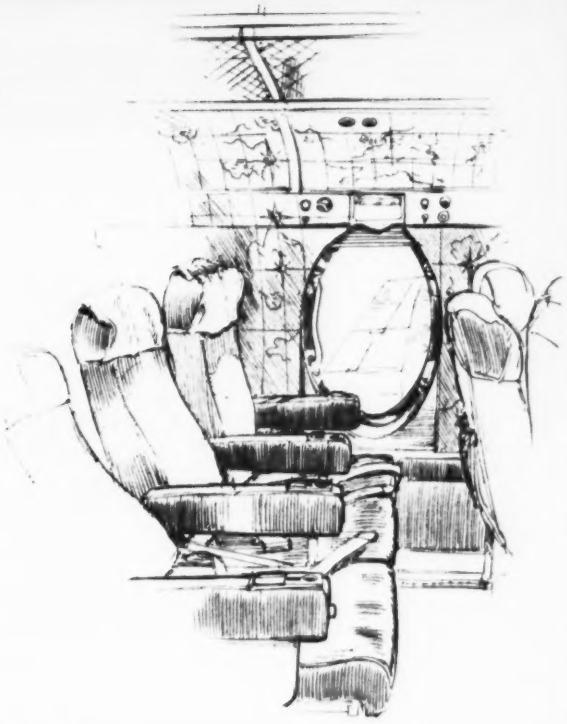
Ghosts are flying 600,000 engine-miles a week in airline service, and up to August 31 they have flown 32,000,000 engine-miles since the Comet went into service on May 2, 1952.

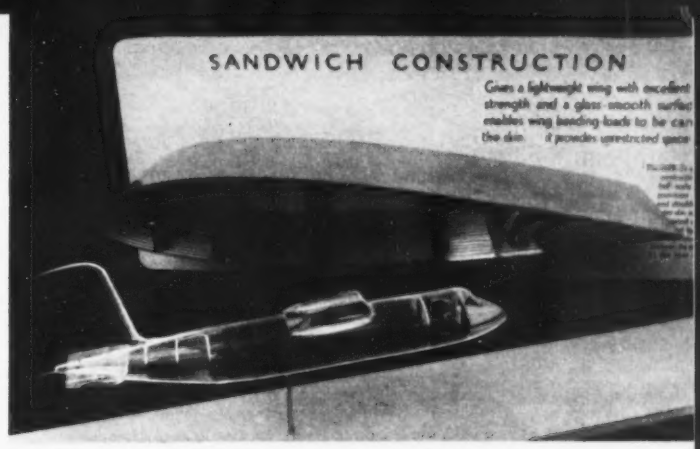
The new de Havilland Gyron jet engine, incomparably more powerful than the Ghost, in fact almost certainly the most powerful jet engine in the world to-day by far, has been designed out of the knowledge gained from all this experience. It is intended, in its initial form, for supersonic fighters, but is capable of development for other roles. It is essentially a light, simple, economical jet of enormous output, and like all de Havilland engines it is built for durability

THE GHOST—THE JET ENGINE THAT MADE THE COMET POSSIBLE

D E H A V I L L A N D

E N G I N E S




SANDWICH CONSTRUCTION
Gives a lightweight wing with excellent strength and a glass-smooth surface
enables wing bending loads to be can
the skin
it provides unrestricted space

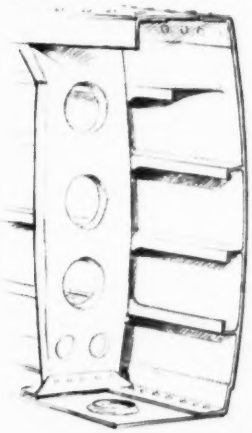
The interior of the 47-seat Viscount for Air France (left) is refreshingly "different." The reclining seats are in rust-coloured tapestry with white nylon headcloths, while a travel motif is worked into the biscuit-coloured wall linings in the form of "topographical murals"—suns, trees, rivers, lakes, etc. (Above) A finely constructed Perspex model showed the interior arrangement of the Handley Page H.R.P.3. Above it, a section, with accompanying explanation, illustrated the advantages of the "smooth-surfaced sandwich" form of wing construction.

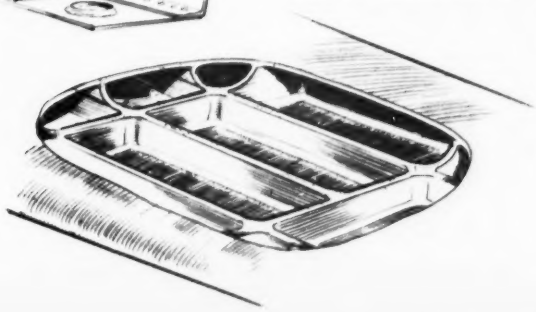
FARNBOROUGH'S FULL WEEK . . .

extensive overseas survey, the company decided that four engines were necessary to guarantee a useful performance when meeting airworthiness requirements at tropical or high-altitude airfields.

Newest amongst smaller transports shown (in model form) was the Series 5 Percival Prince, which embodies several features of the military Pembroke and will carry 12 passengers on 400-mile stage-lengths with full reserves or 10 passengers for 650 miles. The two Doves in the static park—one a six-seater executive version, the other a radio-calibration aircraft for M.C.A.—served as a reminder of the versatility of this type, which has achieved enormous success in the export market. Although displayed in military form, the new Leonides-powered Canadian-built Beaver 2 appealed to many European charter and "corporate" operators. This useful six-seater has previously been sold only for dollars; a military order would prime the pump for production by de Havilland in England and the Beaver would, of course, consequently be available for civil customers. An Otter, incidentally, has also arrived in this country for military and civil demonstrations. This year's performance by the Scottish Aviation Pioneer, also Leonides-powered, recalls the recent news that a small number have been ordered by the R.A.F. for service in Malaya, where its phenomenal capacity to operate from small areas will prove of great value. The first example, we believe, is already *en route*.

To the freight operator, the aircraft of outstanding interest was the massive Beverley transport for the R.A.F.—offered to civil operators as the Universal,





(Left) An example of stringers machined integrally with skin, seen on the Hawker Siddeley stand. (Below) Bristols showed a small, sharply swept wing in moulded Durestos laminate, assembled from four mouldings only. Port and starboard halves are again split along their thickness-centre.

a model of which was displayed in the static tent together with a revealing map illustrating its extremely low direct operating costs when carrying unprecedented loads over short and medium stage-lengths (to quote an example: 11.75 pence per ton/mile with a payload of 17 short tons over a 1,000 mile stage). The tail boom alone of the Beverley has a capacity equalling that of a fair-sized airliner; it will hold no fewer than 42 passengers. Latest versions of the Bristol 170 were also on show—the Mk 31E mixed cargo and passenger transport and Silver City's Mk 32 Superfreighter which made its Farnborough debut on Thursday during the "all-civil" flying programme.

Sir Miles Thomas has written of the difficulty of deciding which type of airliner will best meet B.O.A.C.'s requirements in the 1960s and 1970s. Civil versions of the three V-bombers are being prepared for this rôle and the models of the Atlantic, H.P.97 and Vickers 1000 (in civil form, V.C.7) showed clearly how these great transport projects will retain the particular advantages of, respectively, the Vulcan, Victor and Valiant. Mention of this trio, however, indicates only part of the problem faced by B.O.A.C.'s planning staff. The Bristol company insists that "the turboprop will dominate commercial aviation as far into the future as anyone can see", and are known to be designing a formidable successor to the Britannia, and de Havilland's projected Comet 4 will obviously embody very advanced thinking; but both the Filton and Hatfield contenders remain on the "dark-horse" list. More than one Farnborough Week will pass before the answer to this weighty problem is resolved.

TRENDS IN DESIGN AND CONSTRUCTION

DISCERNIBLE by all who were privileged to see the 1953 flying display at Farnborough was the wide variety of design concepts held by the various manufacturing companies. In the varied wing plan-forms displayed probably lay the most striking and immediately obvious difference. A visit to the static show to examine the methods behind the shapes showed however a similar variety in the materials and constructional processes used, and some of the more significant trends in design and manufacture are here briefly discussed.

Wing shapes present were diverse. The appearance of the Victor in the flying display gave most people their first close-quarters view of the crescent wing, claimed by Handley Page to combine the merits of straight swept wings, thin unswept wings, and the delta wing. Reduction of the tendency to tip stalling, by lessening the sweep-back over the critical wing-tip portion is an undoubted advantage of this configuration. The reduction of both sweep-back and wing thickness in three stages towards the tip assists in combining good aeroelastic properties with a delay in the onset of compressibility effects. Against this must probably be placed the penalty of increased complication and weight due to the cranking of the wing.

The delta-winged Vulcan, developed from the Avro company's smaller 707 research machines, is directly comparable in function with the Victor, and the progress of these rival designs will be keenly watched. The delta wing provides the simplest solution for most aeroelastic problems, possessing small aspect ratio and high stiffness, but is possibly less advantageous for large-size machines. Much experience has of course been obtained by Avros of the behaviour of delta machines; while high- and low-speed research continues with the 707As and 707B, the 707C two-seater for pilot familiarization is the latest of the small models to appear.

An intriguing new approach to the problems associated with

(*Continued on p. 410, after double-page of Farnborough photographs.*)

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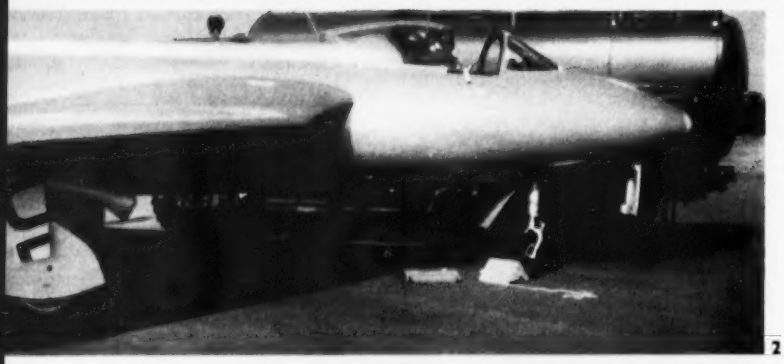

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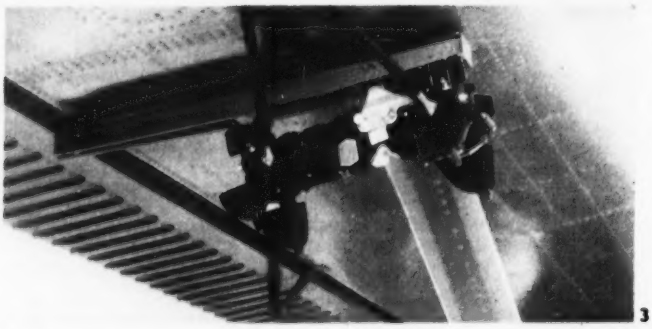

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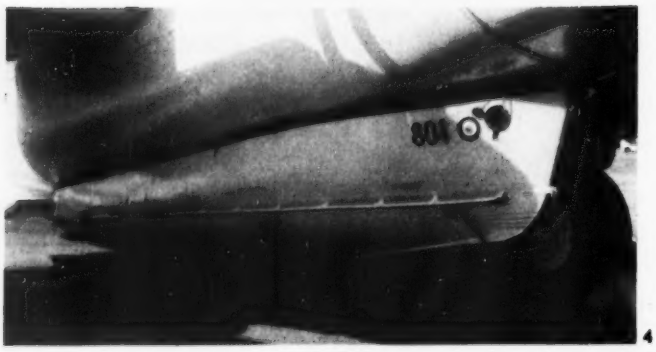

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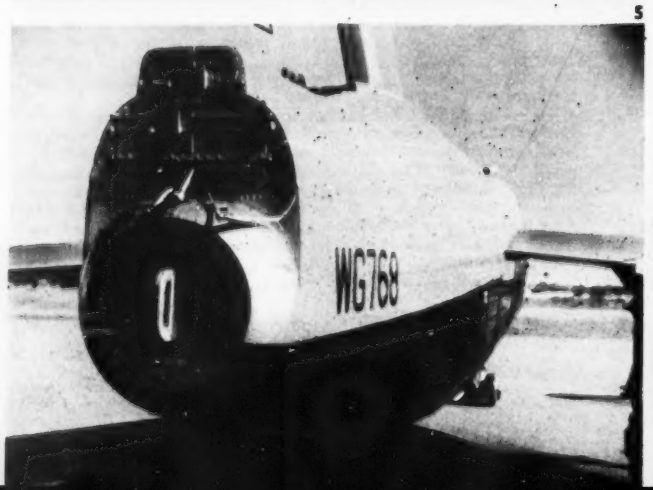

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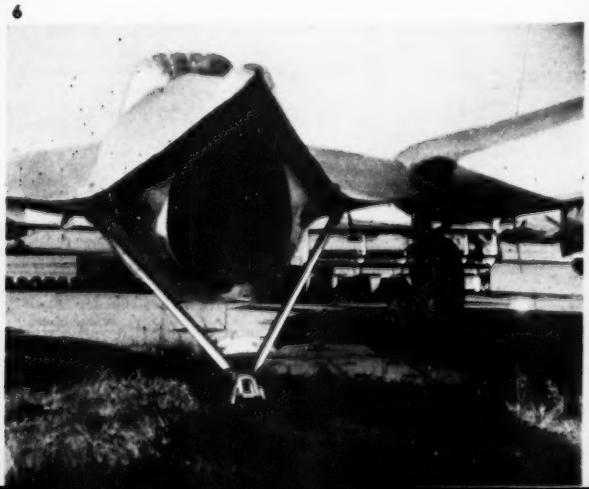

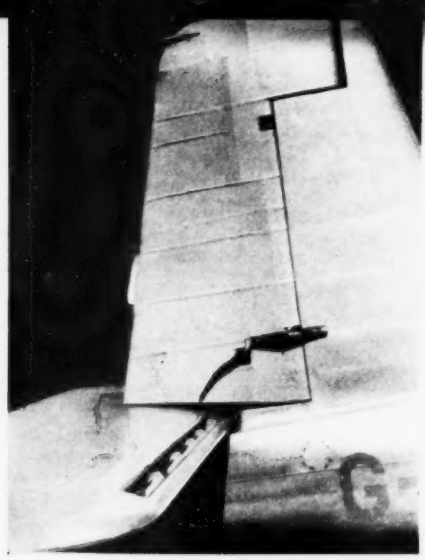

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Round the

ONE of the most rewarding sections of the Farnborough Show is the static park, where the aircraft to be demonstrated in the afternoon, are ranged during the morning, and where visitors are allowed to inspect them at moderately close quarters. The *Flight* photographs on this page show some of the noteworthy details to be seen there last week. Various items of equipment often give a hint as to the eventual application of particular prototypes as, for instance, in photograph No. 3, which shows a carrier rack fitted under the wing of the Beaver Series 2; or, in picture 4, the new Saunders-Roe lifeboat fitted to the bomb-bay of the Shackleton 2. Picture 8 shows further the nose configuration of this aircraft, with windscreen wiper and de-icing spray-bar on the bomb aimer's panel, the neat housing of the two 20 mm cannon, and the gunner's sighting position.

Also to be seen in the static park were examples of the new generation of fighters, the de Havilland 110—shown in Picture 1, with the observer's access hatch open—and the Hawker Hunter F.2, revealing for the first time the gun pack in the under fuselage. The gas-ejection pipes for the two starboard cannon can be seen under the engine intake, where panels have been removed. Photographs 9 and 12 give some idea of the impressive proportions of the two new all-weather fighters, the Javelin and D.H. 110. On the Javelin, the position of the landing lights on the main undercarriage legs and the large gun-ports half-way out along the leading edge, as well as the very large dielectric nose-cone housing the radar search equipment, give a sobering

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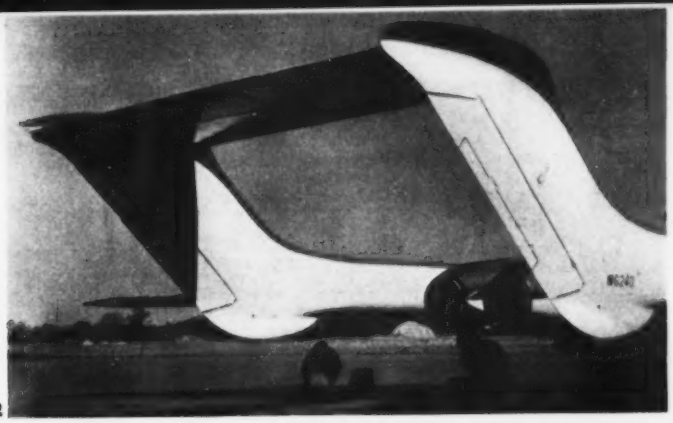


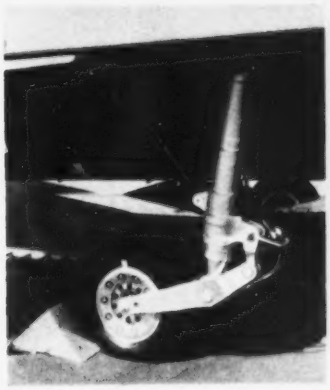
12

Viewing Area

foretaste of things to come. Picture 12 shows the tail of the D.H.110, now of slightly modified outline, standing like a triumphal arch over the jet pipes. It is interesting to note the difference in treatment of jet-pipes between those in this picture and those of the Javelin in View 7. This picture further shows the cooling-air shrouds round the jet-pipes themselves, and the "mice" attached to the inner faces of the jet-pipes for nozzle-area adjustment. Another example of the de Havilland tail treatment is shown in Picture 6—a view of the Sea Venom all-weather fighter. The arrester-hook is seen dropped clear of its housing and resting on the ground.

With the increasing application of tail-braking parachutes, it is interesting to note the housings employed for them on the research prototypes, the S.B.5 in Picture 5, and the Boulton Paul P.111A in Picture 11. The S.B.5 is fitted as well with an anti-spin parachute, and as on the P.111A, the cable attachments for these parachutes remain exposed in the sheltered section of the square-cut tails.

Picture 10 shows that the Prestwick Pioneer still retains the inverted slot in the tailplane, its purpose being to prevent an "inverted stall" of the tailplane as the tail rises during the trim-change while retracting the flaps and slots. The last two pictures, Nos. 13 and 14, show respectively the fixed undercarriage of the S.B.5, which is directionally adjustable to allow for the variable sweep-back of the wing, and the retractable gear of the Boulton Paul P.111A, the wheels of which are fitted with Maxaret skid-preventing disc brakes.



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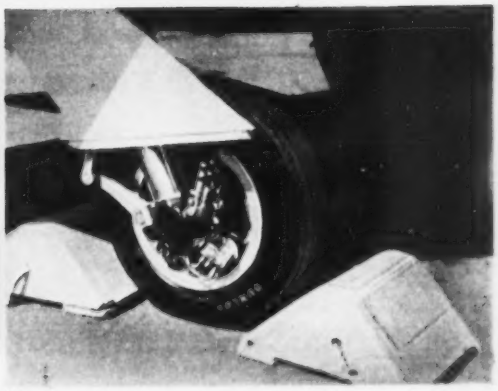

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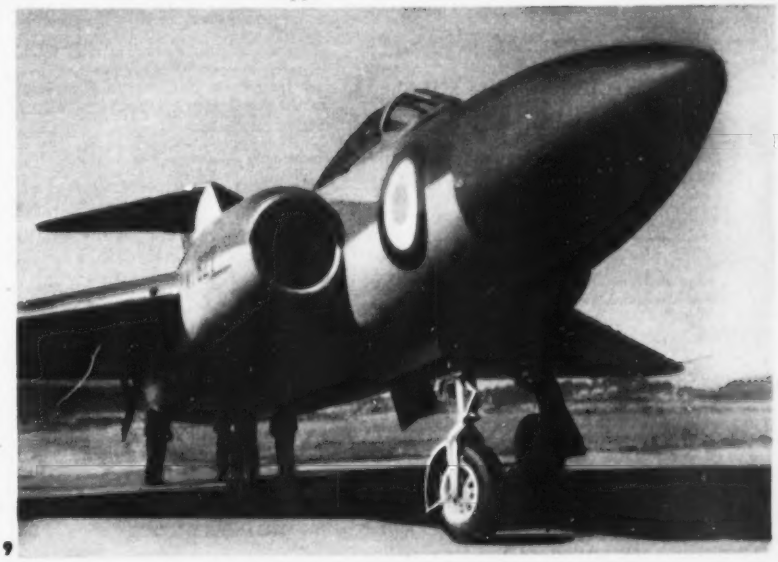

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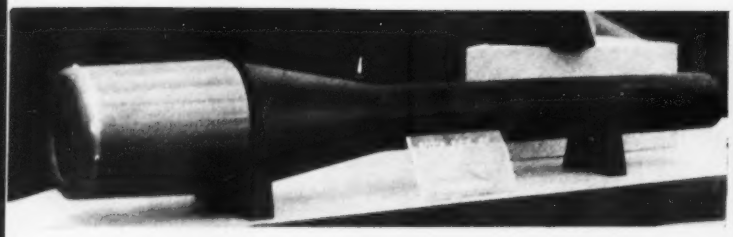
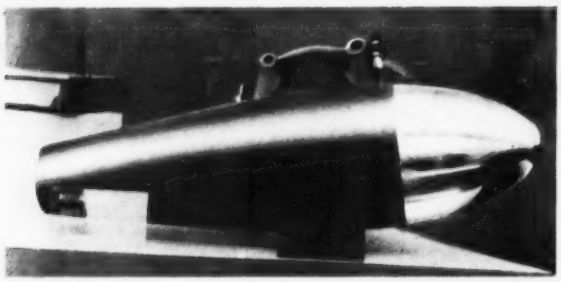
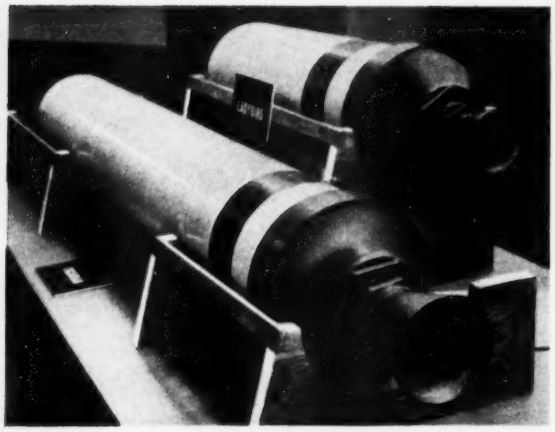
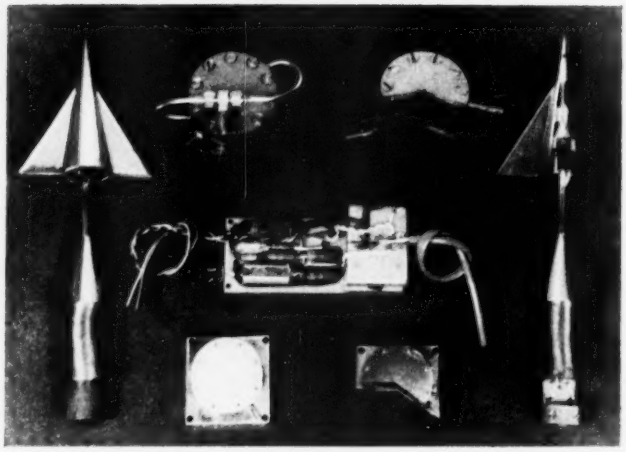








The two Fairey developments illustrated above are the helicopter rotor pressure-jet and (top) pulsejet. On the right are the M.o.S. Scarab and Ladybird rocket-motors (upper picture) and missile-borne transducers—briefly, devices for converting mechanical movements into electrical signals—by the Bristol Aeroplane Company.

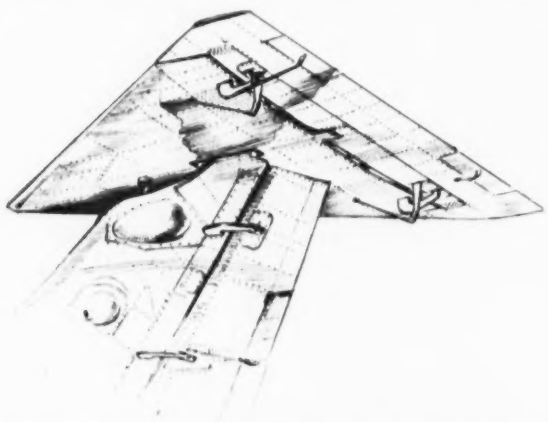
FARNBOROUGH'S FULL WEEK . . .

wing flexure was shown, for the first time, in model form at Farnborough. This was the aero-isoclinic wing of the Short S.B.4 Sherpa, a small research aircraft which is shortly to fly and is intended to be the forerunner of a larger high-altitude high-speed aircraft. The principle of the aero-isoclinic wing is to ensure that a constant angle of incidence is maintained along the flexural axis of the wing when under load—theoretically an ideal approach to tip-stalling, instability and other problems caused by aero-elastic distortion. Movable wing-tips are employed.

Another small research type, the Derwent-powered Short S.B.5, is being used for the investigation of the low-speed characteristics of swept-wings, and features thin wings of adjustable sweep. A triple research programme is being carried out, at sweep-back angles of 50 deg, 60 deg and 69 deg respectively; the second of these is being performed at present. The variable-incidence tail-plane with + 10 deg movement from the horizontal was the source of much interest while the machine was in the static park at Farnborough, and is illustrated in the sketch below.

Of the new machines flying, the Short S.B.6 Seamew evoked much comment. The design trend here is simply towards simplicity and economy in construction; that this has been attained to a marked extent is proved by the remarkably short time (18 months) in which the Seamew has been designed, constructed, and flown.

Three models were shown of Dakota-replacement projects, the Aviation Traders Accountant, the Percival P.87, and the Handley Page H.P.R.3. The first features the novel "tensioned skin" method of construction described fully in *Flight* of July 31st this year, which should achieve by its commendable simplicity a considerable reduction in tooling costs and all-up weight. Dart turboprops are specified. Simplicity is the keynote also of the other two designs. Pusher turboprops (Napier units of smaller power than the Dart) are an intriguing part of the Percival design, the pusher layout being chosen to give an upper wing-surface that is smooth up to 20 per cent chord, with resulting improvement in C_L max and overall performance. To keep the cost low, the number of bought-out items is being minimized.



How provision is made for a wide range of incidence-adjustment on the tail-plane of the Short S.B.5.

Four Alvis Leonides Majors are to provide the power for the high-winged H.P.R.3 in which simplicity and robustness are again stated to be the basic criteria. Sandwich construction in the wings is employed, in an attempt to provide adequate stiffness with the minimum of weight. A corrugated core is sandwiched between two skins, the outer skin being spot-welded and the inner skin pop-riveted to this core. The corrugations run spanwise between the webs and chordwise to the rear of them, as shown in the photograph of a half-scale model wing section on page 407. Victor experience is incorporated.

Another interesting form of sandwich panel construction, shown by Essex Aero, Ltd., consisted of a core of closely-spaced Hiduminium cones, half of which were attached to each of the upper and lower sheets. The attachment can be by means of riveting, spot-welding, gluing or soldering; on the example shown, a Bakelite thermo-setting adhesive was used. The main advantage of this method, it is claimed, that directional effects are avoided.

Several types of machined integrally stiffened wing structures were shown, notable examples being those of Armstrong Whitworth and Shorts. Reduction in the number of detailed parts and an increase in the strength/weight ratio are the main advantages, probably obtained, however, with increased machining time and cost.

In the field of plastic materials, as might be expected, much development continues. The new resins, which have been recently developed, have helped in obtaining greatly improved materials and components for particular duties. Aircraft radomes of reinforced glass were seen on several stands, while a glass-cloth ventral tank was shown by Shorts, and a moulded Durestos swept-wing by Bristols. The front fuselage of the production Skylark sailplane, of moulded Fibreglass and Marco resin, was shown on the Fibreglass stand.

An interesting constructional method in an interesting design was the low-density foam resin filling of the A.S.T. high-speed towed target. The wings, fins and the fore end of the fuselage are filled with this foam resin, which serves the double purpose of localizing shell damage and of stabilizing the thin outer skin. In addition, the fuselage filling provides the ballast necessary

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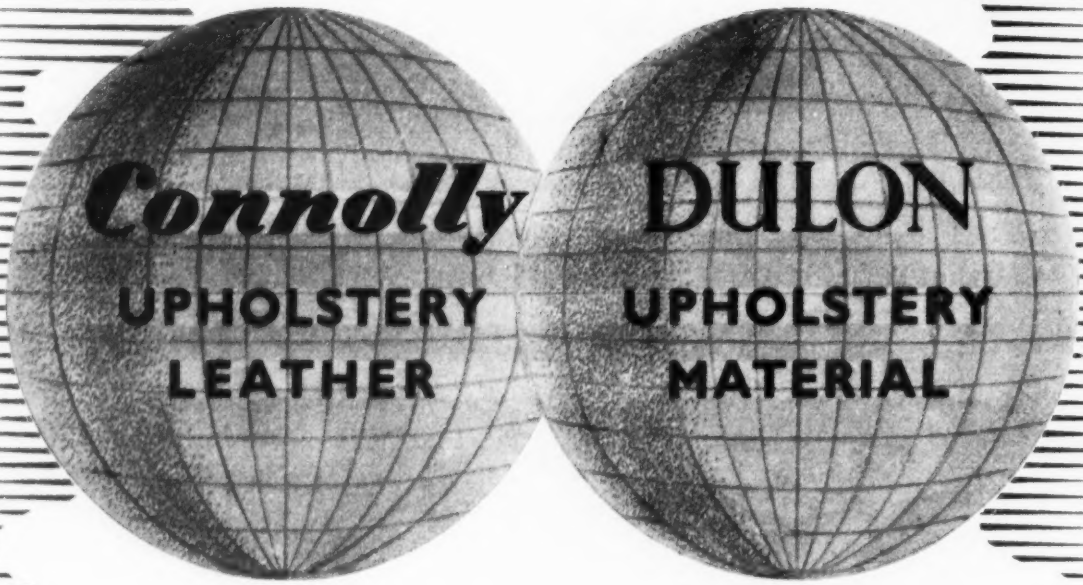

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The PRINCE, powered again by "Leonides" engines, is also in service in large numbers with the Royal Navy as a communications aircraft and as a "flying classroom" for radio, radar and navigation training. The PEMBROKE, the R.A.F. version of the PRINCE, ordered in quantity by and now in service with the Royal Air Force, has also been adopted by the Southern Rhodesian Air Force and the Royal Belgian Air Force. The functions of the PEMBROKE include passenger transport in rearward facing seats, freighting, supply dropping by parachute, casualty evacuation, aerial survey and photography and twin engine pilot training. A classroom version for training navigators and bomb aimers has also been developed.

For civil operation the PRINCE serves in many countries throughout the world for executive travel and with internal airlines, carrying 8 to 12 passengers. PRINCES have also been supplied to the British Ministry of Civil Aviation for radar and radio aids, calibration and testing. Its exceptional capacity, comfort and high performance meet the exacting demands of world-wide operating conditions, whilst versatility is exemplified by the SURVEY PRINCE, the only modern British aircraft developed especially for aerial photography, mapping and land survey.

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for adequate longitudinal stability. Shell holes in the target may be repaired simply by filling the cavity with foam resin, profiling and painting over with rubber-based paint. For larger areas of damage, blind rivet patch plates may be added.

These are some of the new shapes, means and ways, seen at Farnborough 1953. Together with the many other developments, in power plants and specialized components, described elsewhere in this issue, they make up a story of continuing research in all directions.

MORE ABOUT THE STATIC SHOW

As ever, a tour of the vast exhibition hall, tent, or marquee (call it what you will—it is, in effect, a vast low hall with a canvas roof, incidentally in great need of an air-conditioning system on the hotter days last week) was a rewarding experience. In the notes that follow, a number of exhibits of a widely varied nature but of outstanding interest are discussed in some detail; and next week the "static story" will be continued, for a great deal remains to be described.

The Ministry of Supply seldom fails to bring something really new to the show, and the attraction is always heightened by a modest lifting of current security-curtains. This remark applies, in particular, to rockets. Although the solid-fuel rocket motor is one of the simplest types of engine imaginable, much work is still being carried out by the R.A.E. Rocket Propulsion Department, at Westcott, towards its perfection. Two sizes of assisted-take-off unit were shown on the Ministry's stand: the Scarab (3,000 lb mean thrust for six seconds) and the Ladybird (1,500 lb for the same period). Both contain a close-packed cordite charge in a steel case which is closed, after filling, with a heavy machined end-cap. In the centre of the cap is screwed the carefully profiled venturi nozzle.

The manufacture of the 45-ton steel case calls for considerable experience and good material; British Messier contribute a fabricated sheet-steel case, the seams being automatically welded to ensure uniformity in production; and the Chesterfield Tube Company manufacture seamless tubing by their cold-drawn process. But experiments are continuing in the search for other materials, and it now appears certain that rocket cases can be mass-produced in various types of plastic. With a burning time of but six seconds, little deterioration in strength is experienced before the "all-burnt" condition is reached, and the case is then jettisoned.

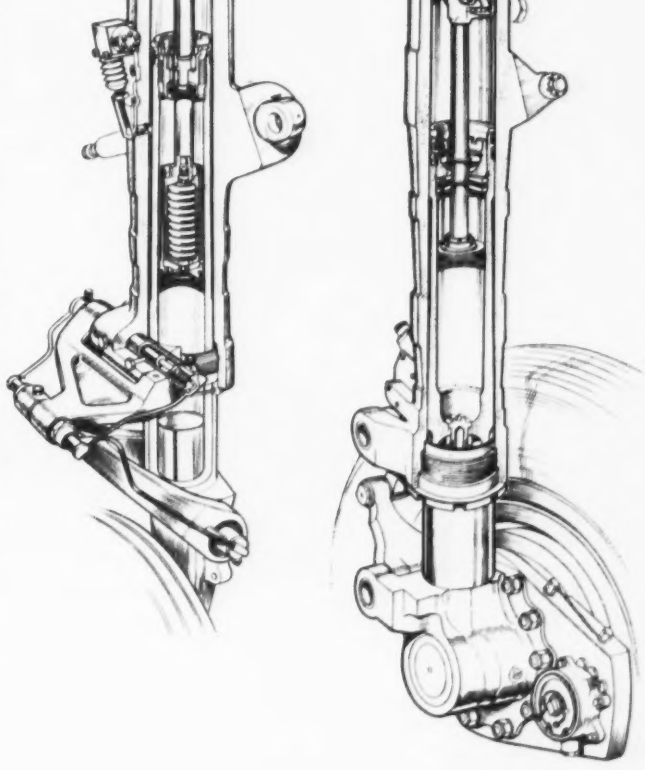
Turning now to the industry, there were several noteworthy engine exhibits. For example, the Napier Eland, though perfectly conventional, is an engine of exceptionally fine design, and it draws upon the great experience of the company, particularly that gained with the Naiad. A single-shaft turboprop, the Eland has a ten-stage, constant-diameter axial compressor, working at a pressure-ratio of 7 to 1.

Unusually, the rotor discs are splined on to their drive shafts, and are not joined around their periphery. This is claimed to reduce out-of-balance forces and eccentricity under high centrifugal load. The intake air is passed through a row of three-position variable-incidence guide vanes, to preserve a smooth flow to the first rotor stage under all conditions.

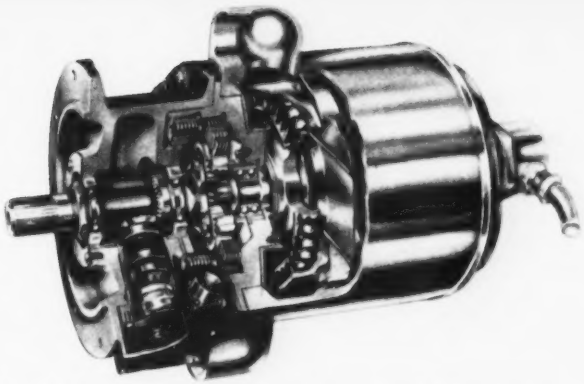
From the compressor the air passes to the six combustion chambers, which are located by quick-release clamps permitting individual cans to be removed without difficulty. Inside each chamber is a very efficient upstream burner, and two of the cans mount an igniter plug supplied with high-energy, high-frequency power from a patented Napier ignition system, which is stated to provide outstanding starting and relighting under the most adverse conditions. Other unusual features are the hollow turbine nozzle guide vanes, which reduce thermal stresses, and the manner in which the whole turbine assembly is supported from the outside by a tubular framework. The whole engine, in fact, abounds with commendable detail features.

As at the last S.B.A.C. show, a number of new undercarriage developments were of great interest. On the Dowty stand, for instance, was a Vulcan bogie, and the main units for the Hunter and Javelin. The bogie was of the production pattern, in which all brake piping is carried down inside the capacious main tube, which is otherwise empty, except for a small jack to rotate the bogie during retraction. The Hunter and Javelin legs (illustrated here by our artist) are both of the Liquid Spring type, in which a special fluid acts as the absorbing medium, at a pressure of some 45,000/50,000 lb/sq in, retained by Dowty seals.

The Javelin leg is a straightforward telescopic unit, although careful design was necessary in order to get it to fit into its retraction space. The big delta wing notwithstanding, this aircraft has a wide track, and the wing is quite thin to permit supersonic flight.



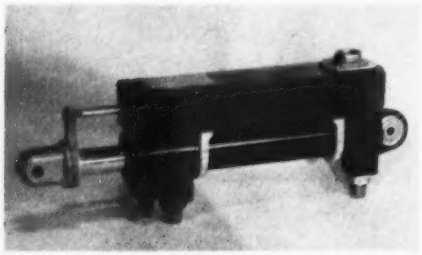
Dowty undercarriage legs for the Hunter and (extreme right) Javelin. Both are high-efficiency Liquid Spring units.

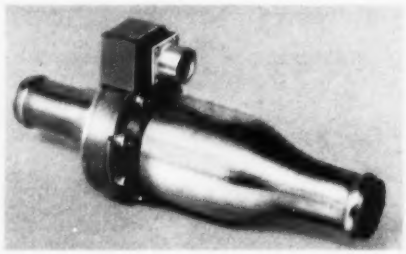


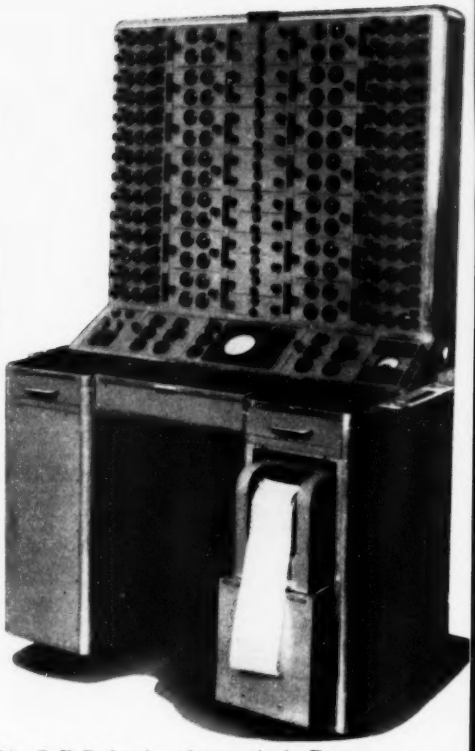
One of the new Rotax liquid-fuel turbine starter motors in part-section. The company is developing several units of this kind, for operation on various fuels, including kerosine or petrol from the aircraft tanks.

The Hunter unit has an efficiency over 90 per cent, and consequently can accept rates of descent of 14ft/sec (swept-wing aircraft were, at the time of the design of the Hunter, expected to demand such a performance of their landing gear, although the Hunter, at least, has plenty in hand in this respect). Compared with earlier fighter undercarriages, the Hunter unit shows a complete absence of flexible hose, the brake pressure being transmitted through rigid piping. Provision is made for Dunlop Maxaret, and this is standard on production aircraft. As in the Wyvern, the retraction jack acts as the side-stay.

Another new undercarriage unit was that for the Seamew, built by British Messier. This stalky, but neat, unit has a stroke of something like two feet and, as the outer shell also acts as the oleo wall, it is unusually light. At the lower end a simple fork carries the small wheel, with its single-disc hydraulic brake, and thin high-pressure tyre. Drag is very low, and has a negligible effect on Seamew performance. The top of the leg has a simple lock fitting—similar to the Messier jack-lock—with which it can be attached to the airframe simply by pushing it up through the wing undersurface. It is typical of the Seamew that it is quicker to change a leg than to change a wheel. Also shown by British







From the left: Servo-motor Type A for the Sperry Mk 11 Auto-pilot; Flight Refuelling Mk 17 "in line" refuelling valve, weighing 28 oz. and claimed to be the lightest and most compact valve of its kind; and the very practical Short analogue computor.

FARNBOROUGH'S FULL WEEK . . .

Messier was the main and nose undercarriage for an aircraft whose identity must, for the time being, remain secret. The main unit was illustrated and commented upon in our September 4th issue. It carries a very-high-pressure tyre and the geometry suggests that it will be housed within a swept wing. The nose gear is short and neat and, during retraction, the hydraulic steering jack turns the leg so that the wheel lies flat in the nose of the aircraft.

It can now be said that the massive Goodyear wave-type wheel exhibited was the pattern employed on the Valiant B.2. The fact that four such units are fitted to each of the new bomber's bogies underlines the very great increase in weight of this aircraft, in comparison with the earlier Mk 1 Valiant. The wave-type wheel was developed to permit forging in magnesium alloy, although the Valiant unit shown was cast. That particular attention has been paid to ease of servicing is shown by the fact that the brake discs—system pressure is 900 lb/sq in—can be examined *in situ*; the whole design, in fact, facilitates inspection without the need for any dismantling. A three-spot brake unit goes with each wheel, and the tyre size is 43in. The whole unit is of Goodyear (Wallasey) design and manufacture. Smaller units of the same family are expected to save B.E.A. £1,000 a year, fitted to the Pionair-Leopard freighters.

The same airline expects to save a similar sum when the Viscount fleet is re-equippd with Rotol rebated-blade airscrews. The new blade is a solid duralumin forging, the leading edge of which is rebated over the inner two-thirds radius. This cut-away portion is filled with an electric heating element consisting of woven glass and wire fabric, with an outer covering of black neoprene rubber. The whole is cemented down and ground flush, and is said to have no measurable effect on performance. Compared with the blades originally used, the new pattern is easier to service and repair. Rotol also showed the synchronizing equipment already flying in the Comet 2 and soon to be fitted to Viscounts.

Flying safety will gain by the adoption of such devices as the Ferranti air-stream direction detector. The sensing head of this equipment consists of a short tube—visible in the illustration below—whose area of 0.0091 sq ft can cause no real performance-loss, even on supersonic fighters. From narrow slots, parallel to the tube axis and 90 deg apart, ram air pressure is led to a chamber, where the pipes from the slots act on opposite sides of a paddle. The paddle shaft is geared down to drive the shaft upon which the sensing probe is mounted until the slots are symmetrically disposed with regard to the local airflow, the two ram pressures then being equal.

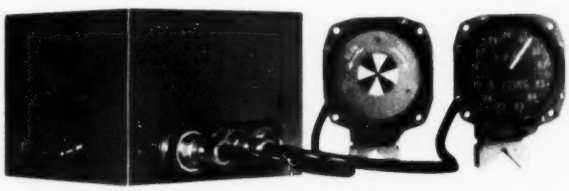
Movement of the paddle shaft is recorded on an angle-of-attack meter, with a 20 deg range. From the demonstration rig we saw—driven by an air stream moving at no more than 60ft/sec—the accuracy and response appeared all that could be desired, the brochure figures being "within one-tenth of a degree" and "five c.p.s. at 200 knots I.A.S." The probe can be fitted to measure either angle of attack or yaw according to which way it is mounted. It can be applied to any aircraft, once initial calibration has been carried out.

New Kelvin and Hughes products shown included two types of stall-warning device, the need for which is becoming daily more apparent. One pattern, developed and patented by G. F. Bethwaite, a lecturer in the Department of Flight at Cranfield, consists of a small metal plate mounted above the wing at about 90 per cent chord—where no icing should be met. The plate is hinged to rock about a spanwise axis, and is normally held forward by a spring. Ram air pressure, however, holds the plate against the spring in flight until—as the stall approaches—decreased ram and the onset of flow reversal allows the spring to pull the plate forward so closing an electric circuit. Spring tension can be adjusted to cause operation at any desired speed, 1.1 V_s being typical.

The second instrument is the Youngman detector, in which two capsules are respectively connected to underwing static pressure and full ram pressure. As the stall is neared, the static pressure becomes proportionately greater, although both pressures fall away together. When the static pressure reaches a value fixed for a given aircraft—perhaps 60 per cent of ram pressure—an electric contact is closed by the relative capsule movement. Both the Kelvin and Hughes systems can be used in conjunction with stick-shakers, horns, or any other type of warning.

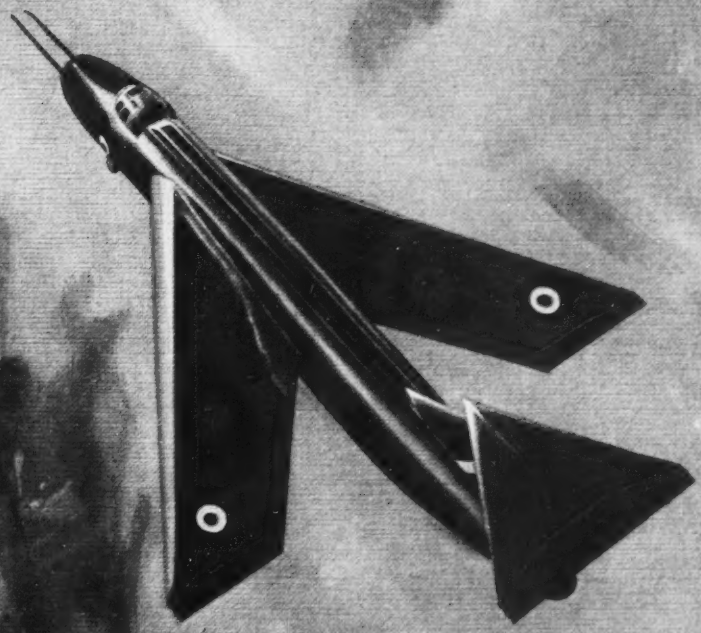
Briefly referred to in our pages last week was the Boulton Paul variable gear and datum change mechanism. This permits unworried piloting over a wide speed range without overloading the airframe, the control-surface deflection caused by full travel of the pilot's controls being progressively reduced as indicated airspeed is increased. This is accomplished—very simply, in principle—by placing two control rods roughly at right angles to each other, and constraining the pivot between them to move along a guiding ramp. When the ramp is at 45 deg to both rods, the longitudinal motion of both rods is the same, but rotation of the ramp varies the gear ratio as the tangent of the ramp angle.

The limitation so placed on high-speed control-surface movement can lead to difficulties in that all the available movement in one direction may already be taken up to trim the aircraft. Accordingly a separate trimming mechanism is incorporated in the control run, so leaving the pilot with the full movement permitted by the gear ratio in use. Electric trimming is provided, with a fast and accurate movement. The datum shift can also be used with powered controls in place of spring bias, with consequent improvement in the "feel."



The Ferranti air-stream direction detector (left) and Kelvin and Hughes precision tachometer with synchroscope.

DESIGN FOR RESEARCH



Control at low speeds. Investigation into the characteristics of swept back wings has called for an adjustable wing research aircraft with more sweep-back than any previously designed in this country. **THE SHORT S.B.5**, with its extremely thin wing able to be adjusted to varying degrees of sweep-back for different experiments, is an illustration of the important aerodynamic research programme going on today in the ever-expanding Short Organization in Northern Ireland

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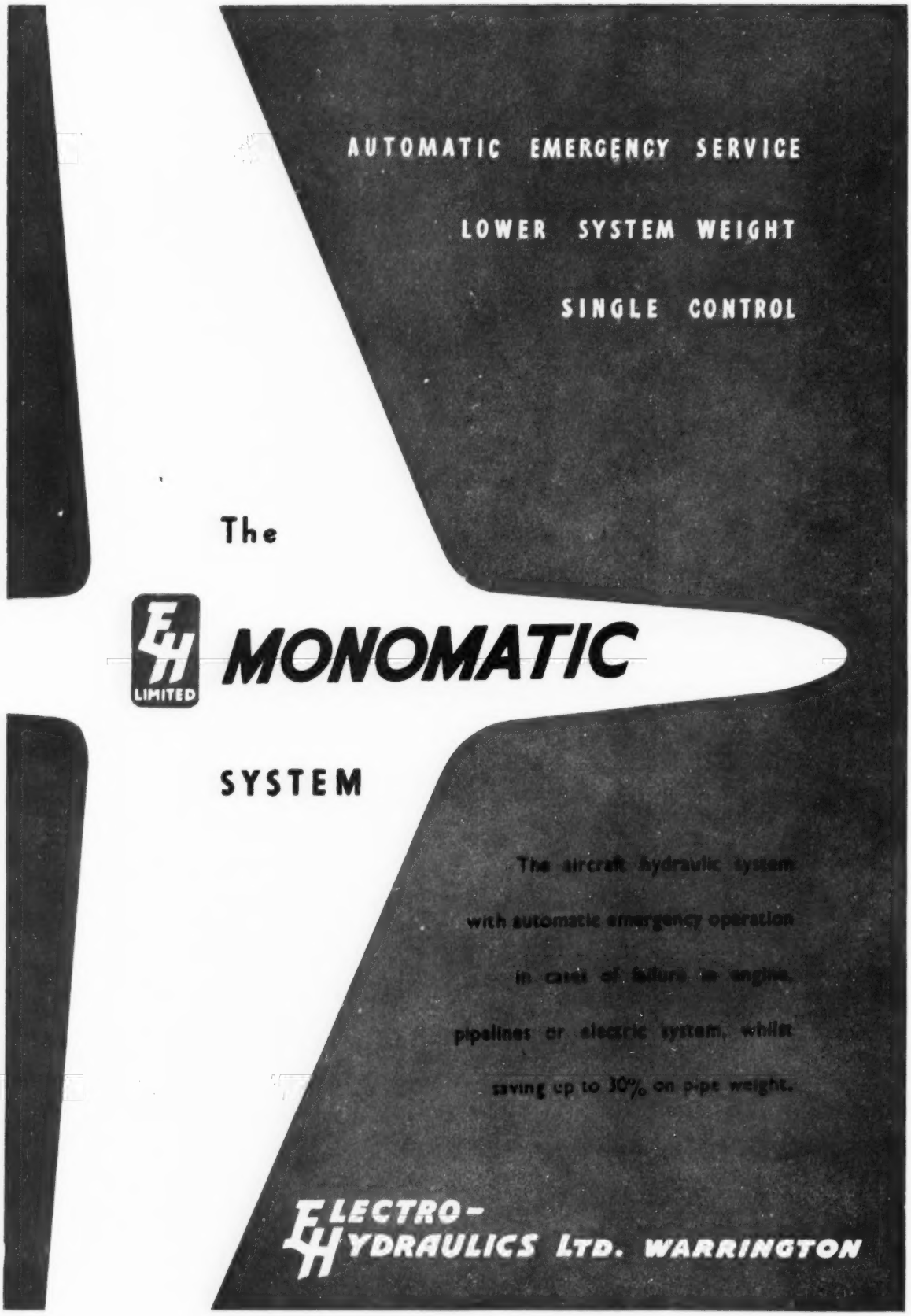
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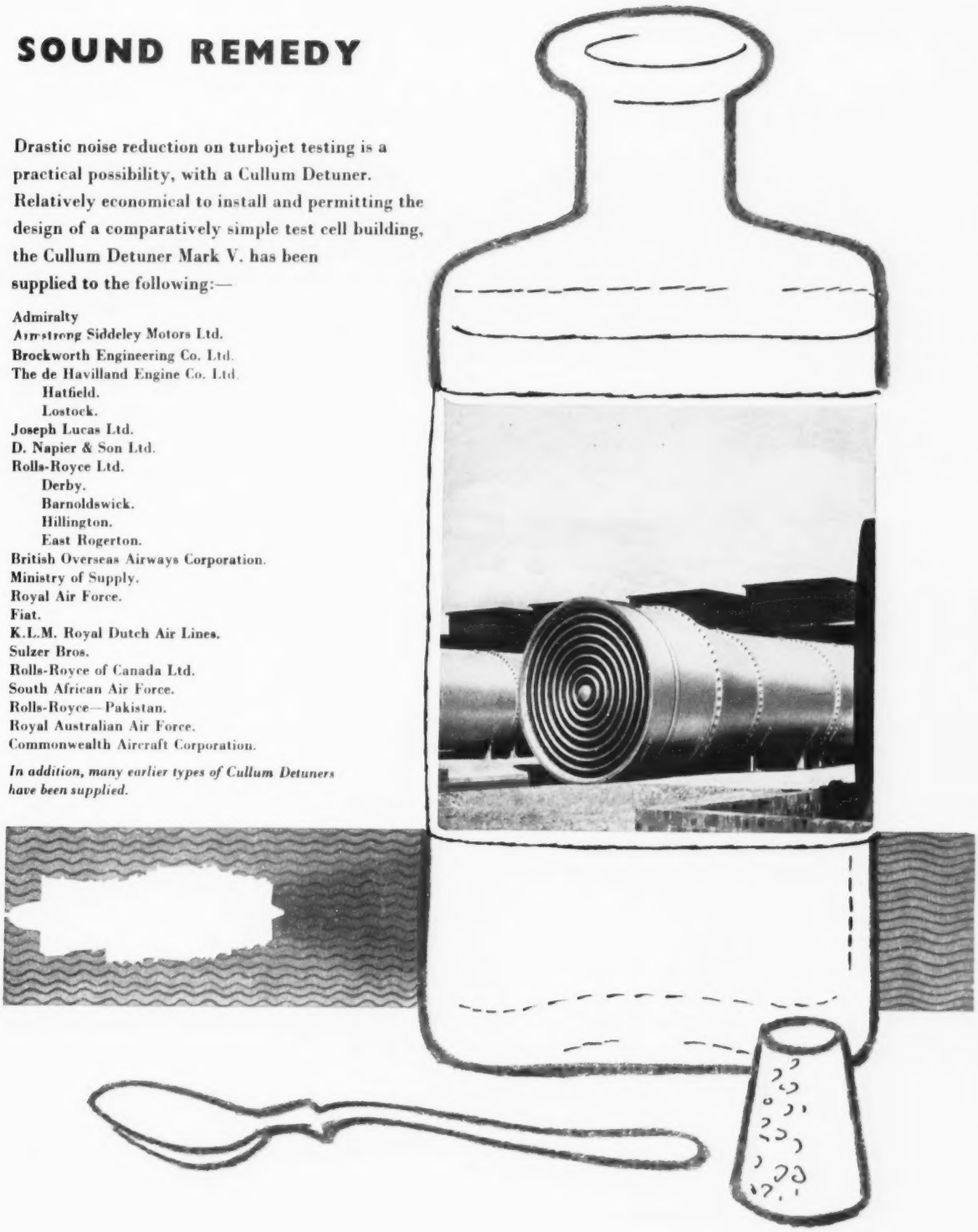

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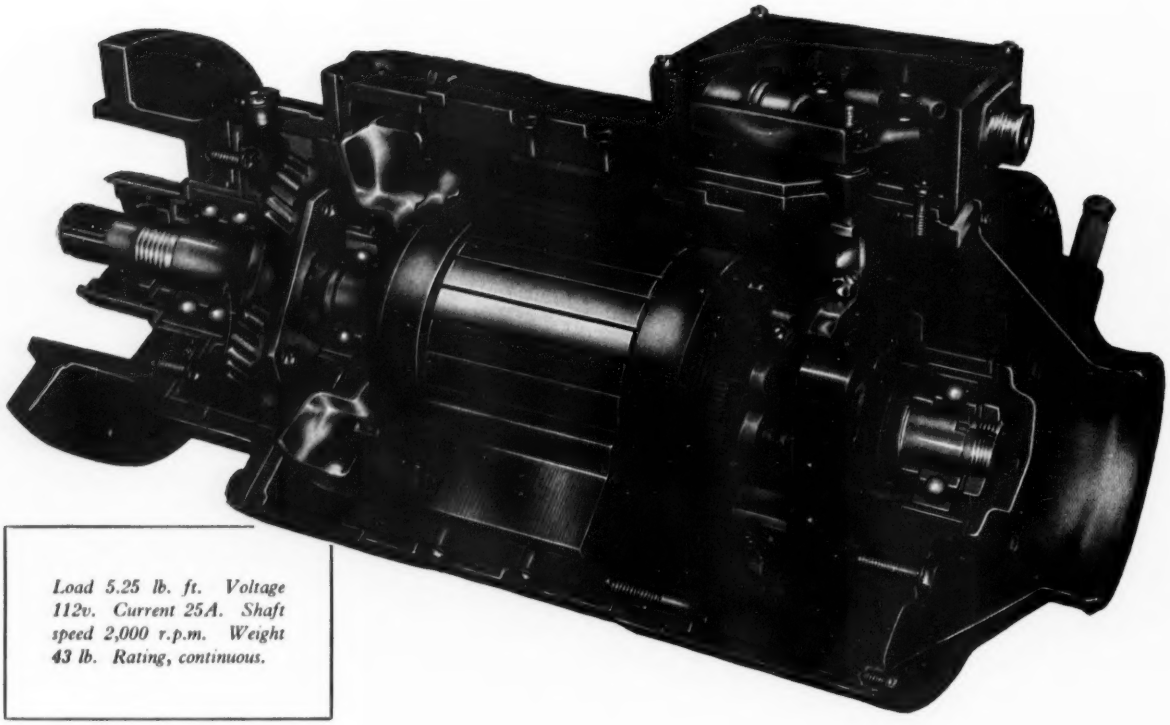

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RADIO AT FARNBOROUGH

A Commentary on New Equipment and Requirements: Notes from the Stands

THIS commentary was prepared after an examination of appropriate stands and equipment at Farnborough by one actively concerned with radio communications and navaids in the air-transport industry. It is followed by a stand-to-stand report on radio and associated equipment.

AIR transport—with which, in this case, we may include private flying—cannot function on an economic basis without communications services; and it is encouraging to see that British radio manufacturers are now exhibiting equipment which will meet the foreseeable needs of the industry.

Aircraft flying on international services must be fitted with radio sets that meet the needs of all routes, because the changing of equipment *en route* is disastrous and very costly. Further, it has been clear for some years that radio telephony is to be the preferred means for all air-to-ground communications, long-range and short-range; so there is already a demand for long-range R/T. sets (and short-range) which can be set up at the home base for working on any, or all of the world's trunk routes, and which need no attention in flight apart from switching from one frequency to another. Until now, the demand for such a long-range equipment could not be satisfied in England, but at the S.B.A.C. Show there was one set—the STR.18C—with 100 frequencies and 100 watts power on H.F. R/T. It was shown as a prototype, and no doubt will undergo modification and development; but it shows promise of success—sufficient to justify ordering it for the Britannia fleet of B.O.A.C.

Meanwhile, for the lack of a set in this category to suit the immediate demands, foreign buyers of Comets and Viscounts are supplying their own radio. They refuse to use the aircraft of tomorrow with the radio of yesterday.

There are, of course, reasons for this state of affairs, associated with the limited resources available and the need to satisfy immediate military demands; but none the less, it is an unfortunate situation. The available Marconi H.F. longe-range and high-power R/T. set is developed from an older equipment, and has not enough frequencies for world-wide operations; but it does satisfy the frequency needs for single-route operation, for which it was made. There are two lower-powered H. F. R/T. sets—to satisfy the needs of short-haul carriers in the less dense traffic areas—making their first appearance: the Marconi A.W.A. HAC-1 (8 frequency 50 watt) and the S.T. and C. STR.19, 4 frequency 50 watt.

There is a need for equipment like this in many places. The S.T. and C. set is just approaching production; and is entirely British in design and build, whilst the design of the A.W.A. set is strongly American, as are many of its components. In some cases this will be an advantage.

Marconi-A.W.A. (the initials stand for Amalgamated Wireless Australasia) also have an aircraft H.F. receiver with provision for 120 frequencies, especially for trunk-route R/T. working. The receiver uses up to 60 crystals, and up to 120 sets of tuning coils, and is built in Australia.

For short-range R/T. working, for approach and aerodrome control, and for aircraft flying, V.H.F. is the accepted medium of communications and the airlines with widespread services have long since realized the need for multi-frequency V.H.F. sets. In this field, both Marconi and Standards are producing sets with 10-15 watts power and 140 frequencies, and these sets will satisfy every likely demand during their life; they are already holding their place with overseas buyers. Standards also make a 10-frequency set, which is adequate for most "local-service" needs outside the areas of high traffic-density; it is the STR.9X, 5 watts power and 26 lb weight.

Light-aircraft V.H.F.

There are also several other aircraft V.H.F. sets, lower in power, and lighter in weight, and with smaller capacity for frequencies. These find their application in lighter aircraft, for private owners, and on very short-haul operations, e.g., in helicopters or gliders. The prospective buyer has a choice of six, all of about one watt power. The Burndept, one frequency, weighs 9 lb, and it is essentially an "emergency use" set. The Ekco, 11 or 22 frequencies, weigh 16 lb; A.W.A. AirMite (three frequencies), 12 lb; Murphy 5, 23, or 36 frequencies, 17 lb; and Plessey (six frequencies), 17 lb; all are suitable for regular use, with a range of about 50 miles at 5,000 ft. In the very light class, the Pye "walkie-phone" has one frequency, and weighs 8 lb including its battery. Each of these has its own application, with its advantages as well as its restrictions.

There was only one A.D.F. shown, and that was the Marconi AD.7092C, with its recessed aerial, as fitted in Comets; and, it is only fair to add, it is being retained by all buyers of Comets because it does its job. The recessed (or suppressed) loop aerial has been proved to be at least as effective as the streamlined loops fitted on slower aircraft; and it may be added that it is usual practice nowadays to fit two A.D.F. sets to new commercial aircraft.

The M.F. beacon is still the most widely used aid to navigation, with world-wide applications of one kind or another. Beacon transmitters, high power or low power, are built by Redifon, S.T. and C., and Marconi's, but there is no novelty in them and they were not at the show. However, Marconi were showing a small-scale model of a V.O.R. station, the navigation aid which works on V.H.F., between 112 mc/s and 118 mc/s; it provides bearings up to a radius of about 100 miles, to aircraft with suitable receivers—and S.T. and C. make a receiver especially for the purpose, combining the V.O.R. receiver with an I.L.S. receiver, and having the I.L.S. meter-indicator common to both systems. For good measure, the receiver will also pick up R/T. over either system, and has 100 receive-frequencies altogether. This may seem excessive, but for area cover, or V.O.R. cover over several adjacent airways, quite a lot of V.O R. stations are needed. The V.O.R. system is not yet used very much outside U.S.A.

Jet Operation and D.M.E.

D.M.E. is usually associated, at least mentally, with V.O.R.; but it earns a place in its own right because of its importance to economic operation of jet aircraft. Jets should start their descent from their operating height at a point from which they can make a direct approach to destination, and the accurate determination of the appropriate point to begin descent can best be done by using D.M.E., with a responder beacon at the terminal airport. The responder beacon and D.M.E. equipments shown by Murphy are already in use and give ranges of up to 200 miles; and Marconi-A.W.A. were showing some similar—but not interchangeable—equipment, used on the Australian airways.

Cossors now have the Gee Mark III receiver, which is a lighter and simpler version of the earlier Gee receiver and gives very accurate navigational information within the somewhat restricted service area of the Gee ground stations.

The Decca navigator system, and its companion the Dectra system, were both explained on the Decca stand, and there was a working demonstration of a Decca receiver and Flight Log, worked from a simulator. The Dectra system, which provides accurate track-guidance and distance information over long distances, was portrayed in use for crossing the South Atlantic.

The accuracy of the existing Decca system was emphasized, and one of the new receivers, which will function on nine Decca chains, was on show. There was also a lightweight Flight Log, which can be stowed in a map pocket and is suitable for light aircraft—and for helicopters, with their unusual navigational capabilities, e.g., to fly backwards immediately after take-off, so as to be able to land straight ahead in case of urgent need. The Decca system now provides coverage over nearly all Western Europe, and far out over the Atlantic ocean—a continuous area of coverage, extending from sea level to the highest flight levels.

Automatic V.H.F. direction-finders for ground use are made by S.T. and C. and Marconi, the former with C.R.T. presentation, and the latter with large-scale meter presentation. The Marconi equipment, AD.200, was shown in association with air traffic control desks designed by International Aeradio, and they formed a combination which looked very useful and completely practical. The S.T. and C. set was not on show, but was fully described, with its application to an area triangulation D/F. service like that provided over France.

The use of intercom equipment has not fallen off at all, although aeroplane cockpits are rather less noisy than they used to be. The reason, of course, is that intercom now provides a means of service control, and enables each crew member to select and use the radio sets which he needs, without interfering with other users' selections. Ultra Electric communications control equipments were again on show, in their two sizes, virtually unchanged since the original production five or six years ago, and exactly as fitted on most British-built airliners ever since. S.T. and C. and Marconi are making equipments which provide similar facilities by slightly different methods; but Ultra continues to hold its place, even on "export" Comets, and against American competition.

There may be little place for air-sea rescue radio sets in civil aviation, although dinghies and dinghy radios are mandatory for certain flights. Lightwight life-saving radio sets, weighing only about 3 lb, were being shown by Burndept and by Ultra. The Burndept set works on 121.5 mc/s, the International V.H.F. distress channel, and provides two-way R/T. as well as a beacon signal,

RADIO AT FARNBOROUGH . . .

while the Ultra uses pulse transmission and, in conjunction with the Rebecca-type search equipment specially developed, provides Sarah service—Search and Rescue and homing. This has been very successfully demonstrated to home and overseas military authorities; and the lightweight Sarah equipment would probably have better range, and be easier to use, than the clumsy M.F. radio sets at present used for dinghy radio. The saving in weight of the dinghy radio sets would itself be an important point.

The aircraft radio sets, and the air-to-ground communication services, are an important part of aviation radio, but only a part. The fixed radio services (point-to-point), for traffic control and airline operational messages, are equally important, and provide a service equally useful to every class of flyer.

The volume of messages to be handled between busy airports is very large, and can be dealt with only by teleprinter, of either line or radio types, so the use of radio teleprinter equipments is slowly being extended—i.e., as quickly as possible with funds available. Radio-teleprinter transmitters and receivers are, essentially, high grade H.F. sets with special adaptors, and in order to provide a regular reliable service are usually operated in parallel, spaced apart, to reduce the effects of fadings. Radio teleprinter terminal equipments were being shown by Redifon and Plessey, and the Redifon terminal was shown in operation, with an Italian teleprinter machine: surely a British teleprinter could have been used for the S.B.A.C. Show? Radio transmitters and receivers suitable for radio teleprinter operation are also made by Marconi and S.T. and C., but were not on show.

The ground end of ground-to-air communications is served by several manufacturers with regard to V.H.F., but only one—Redifon—showed a ground station for H.F. R/T., with provision for four receivers in use on different frequencies, and a spare in the same rack, ready for use. The receivers were for fixed-frequency work, and a control unit for the ground H.F. R/T. transmitters was mounted alongside, the whole arrangement designed—in co-operation with International Aeradio—for very convenient working.

Similar receivers, for fixed-frequency working on H.F. or V.H.F. are made by several other firms, but were shown as separate individual receivers, along with their transmitters. V.H.F. transmitters for air traffic control are usually of about 50 watts power, and typical sets were being shown by Burndept, Pye, and Redifon; others were described in literature by Marconi, S.T. and C., and Plessey.

There were three exhibits of radar sets for providing assistance with airfield control. The Ekco unit has a manually-operated V.H.F. D/F. mounted integrally with the radar scanner, so that the taking of a bearing points the scanner at the aircraft. This ensures that bearing and distance are obtained at the same time. The equipment is mounted in a van, to be easily transportable, and is built especially for one-man operation. It can provide very useful assistance in poor weather, but, of course, cannot handle a lot of aircraft, so is essentially for use at airports where traffic is light. The other two radar exhibits were the Cossor and the Decca, and both were shown in use, though without the automatic V.H.F. D/F. which is a very desirable associated equipment. The radar units have a restricted range—25 miles maximum on the models shown—for airfield control; but within this range they provide a sharply defined picture, with very good accuracy—to a few feet at the shortest range. The Decca equipment has two similar C.R.T. units, and two transmitter units, which can be interchanged by switching in case of breakdown of either unit, thereby improving the reliability of the service. Both makes of radar are mounted in vans, and are readily transportable.

To sum up, there was radio and radar equipment exhibited, on one stand or another, which will meet all the foreseeable needs of civil aviation, but some of it is not yet on the market. Production of competitive British equipment must be strongly urged. The display of light V.H.F. sets, for private owners and short distance charter work, is very good and there is a choice of navigation aids, to meet the most exacting demands of accuracy. Ground equipment of all kinds is available, M.F., H.F., V.H.F., for telephone, telegraph and teleprinter working and of every power likely to be needed, to satisfy the most exacting customer.

A Dutch visitor said to me, "Yes, it is good. Perhaps we need not spend so many dollars now." J.M.

ROUND THE RADIO STANDS

Burndept, Ltd., West Street, Erith, Kent, were showing a lightweight single-channel V.H.F. transmitter/receiver which has been adopted by the R.A.F. as an emergency equipment for jet fighters. The set weighs 9 lb and gives 1½ watts output from a 24-volt supply. It is normally set up on 121.5 mc/s, but is capable of working on any frequency between 117-128 mc/s. A 24-volt 4 a.h. battery is available as a power source for this equipment, and should drive it for about two hours. The set should be quite suitable for use on a glider, where lightness is essential.

The company were also showing their air-sea rescue beacon which is designed to be carried in a Mae West. It works on 121.5 mc/s and can be used for two-way radio telephone as well as beacon transmissions. The very small battery which energizes this equipment weighs 2 lb and will drive it as a beacon for six hours. The Burndept 10-watt V.H.F. transmitter type BE.221 for ground-to-air communication and an associated receiver are also on show. These equipments have been built to an M.C.A. specification for airport control purposes.

Ekco Electronics, Ltd., Ekco Works, Southend-on-Sea, Essex, were exhibiting their aerial coupling unit. This is designed to work with existing H.F. radio transmitters for aircraft and to transfer the output energy from the transmitter into the skin of the aircraft, so as to utilize the skin as an aerial. The model shown on the stand uses a four-turn coil as an inductive coupling, but the company are also working on H.F. slots for the same purpose. The coupling unit has its own tuning and matching device so that it will work over the whole of the frequency range, and it is claimed that this system is not less efficient as a radiator than the conventional wire aerials. The coupling unit is completely enclosed and presents no drag at all. The company were also showing a V.H.F. equipment suitable for the intermediate class of aircraft. It can be set up so as to work on either 11 or 22 independent channels in the V.H.F. band. It weighs 16 lb and has a power output of 1 watt with provision for working either from a 12-volt or 24-volt supply.

The E. K. Cole approach-aid equipment was also on show. It provides a simple aid which can be operated by one man, combining V.H.F. D/F. with radar indication of aircraft height and distance. It is not a substitute for G.C.A., but is a useful aid at airfields which do not carry a lot of traffic. The Ekco airborne search radar equipment is also on show, as fitted to the R.C.A.F. Comets.

Cossor Radar, Ltd., Cossor House, Highbury Grove, London, N.5, were showing a set of Gee Mark III navigational equipment. This is very much smaller, lighter and easier to handle than the Gee Mark II. There was a working demonstration of the Cossor airfield radar, which gives very good definition and would be a most useful aid to air traffic control in conditions of bad visibility. For use as a talk-down aid it would be used in conjunction with a V.H.F. D/F.

Decca Navigator Co., Ltd., 1-3, Brixton Road, London, S.W.9. The novelty on the Decca stand was the lightweight Flight Log. The Mark VII receiver and the Mark 01 Flight Log were shown working from a simulator and the Mark VI Z high-accuracy receiver was also on show. It is capable of working from any of the nine Decca chains.

The Dectra system for long-range air navigation was explained in a leaflet and demonstrated on a map with representation of a track across the South Atlantic Ocean.

The Decca type 424 airfield control radar was demonstrated in operation as a mobile unit. It is designed to be used in conjunction with the S.T. and C. V.H.F. D/F. an combines high accuracy with transportability.

Marconi's Wireless Telegraph Co., Ltd., Marconi House, Chelmsford, Essex, were showing some of their own equipment and some made by their Australian associate, **Amalgamated Wireless (Australasia), Ltd.** There is the 120-watt H.F. equipment, AD.107B/114, providing 20 frequencies for transmit and 30 for receive, and designed as a high-power R/T. version of the AD.107. Transmitter and receiver together weigh about 125 lb. It is at present being fitted in B.O.A.C.'s Argonauts and Comets. There is also the A.W.A. nine-channel HAC-1 transmitter/receiver with 50-75 watts output on R/T. and weighing 65 lb, and the HAC-2 120-frequency crystal-controlled receiver, weighing 38 lb. This receiver has been designed for long-distance radio-telephone working, with pilot control. On V.H.F. there is the Marconi AD.115 140-channel transmitter-receiver, with 15 watts output and weighing 33 lb with its remote controller, capable of working in any frequency between 118 mc/s and 132 mc/s; and at the other extreme, the A.W.A. Airmite V.H.F. transceiver, with three transmit frequencies, a tunable receiver, and provision for intercom—all in a set weighing only 12 lb, and with a range of up to 50 miles. The latest version of the very successful Marconi A.D.F., the AD.7092C, was demonstrated, as fitted with recessed loop aerials on Comets for B.O.A.C. and foreign airlines. There was also an AD.200 V.H.F. direction finder for ground use, as supplied to many overseas governments and in successful operation in many localities. The AD.94 tunable receiver is suitable for M.F. and H.F. and gives high discrimination and exceptional stability, but is built only for direct control. The A.W.A. 200 mc/s D.M.E. system, which is in service along the Australian airways, was described in a booklet, and there was a small scale model of a V.O.R. ground station, and a model of an aircraft radio installation using only Marconi equipment.

On another line there was an air traffic control desk, designed and built in co-operation with International Aeradio, Ltd., which is an excellent example of a good tool for a good job. Ground transmitters—apart from the V.O.R. model—were not on show, but the company makes an extensive range of them, and can supply one for almost every need.

McMichael Radio, Ltd., Wexham Road, Slough Bucks, had a selection of instruments on show, including their radio interference suppressors. These will find application especially on older aircraft—ignition interference does not seem to be any problem on modern types.

Mullard, Ltd., Century House, Shaftesbury Avenue, W.C.2, were displaying radar-sonde and radar wind sets, chiefly of interest to the practising meteorologist. A radar theodolite measures wind speed and direction, and the radar-sonde transmits temperature, pressure and humidity at various heights up to 100,000ft, all these being recorded automatically in ground equipment. The company also builds H.F. and V.H.F. communications equipment, but none of these was on show

Murphy Radio, Ltd., Welwyn Garden City, Herts, were showing their lightweight V.H.F. set for aircraft, with a choice of three control units, to give either five frequencies, 23 frequencies, or 36 frequencies. The transmitter receiver unit is the same in each case, weighing 15¾ lb, with a power output of 1¼ watts, and capable of working from either 12 volts or 24 volts.

The frequencies to be used are set up on the control unit and may be changed in flight in the case of the five-channel set. All three units can provide intercom service, and the facility of 36 V.H.F. channels for about 20 lb is very useful. Murphy 200 mc/s D.M.E. equipment was also

RADIO AT FARNBOROUGH . . .

on show, both the 1 kW responder beacon, RB.110, and two sets of aircraft equipment. The D.M.E. type I is designed for single-seat aircraft and weighs 33½ lb, whilst the D.M.E. Type 6, which weighs 55 lb, has a C.R.T. display as well as a meter indicator, and is intended for larger aircraft, such as the Comet, where it is installed. When working with the RB.110, the equipment gives distance and heading information up to 200 miles. The company also makes passenger announcement equipment for aircraft, but there was none on display.

The Plessey Co., Ltd., Vicarage Lane, Ilford, Essex, had a light-weight aircraft V.H.F. set, PTR.61, on show. This transmitter receiver provides six-channel operation, and the selected six frequencies can easily be changed in flight by changing crystals. There is provision for tuning the transmitter, in a simple way, when frequency has been changed, and this ensures best output. The set weighs 17 lb, and if a remote controller is fitted another 7 lb is added. Power output is 1½ watts, and the set can be supplied to work from either 12 volts or 24 volts. The PR.51B H.F. fixed-frequency ground station receiver and the PR.71 V.H.F. equipment for the same purpose were also being shown. These receivers are similar in application and have been designed for continuous unattended operation over long periods They can both be remotely controlled and are especially suitable for R/T. services.

A complete radio teletype transmitting and receiving terminal was also on show, designed to provide four-channel long-distance point-to-point service. The equipment has been built to International Aeradio's specification for continuous unattended operation and simplicity of maintenance. Radio teletype operation demands a very high degree of stability and this is met by using compensated radio circuits and thermally controlled crystals. The transmitter and receiver equipments have many units in common and this will simplify maintenance.

Pye, Ltd., Radio Works, Cambridge, displayed a 50-watt ground transmitter capable of working on any single frequency in the aeronautical band. The set is fully tropicalized and can accommodate six crystals with provision for rapid re-tuning in case of frequency change. The Pye-Ericsson six-channel V.H.F. radio telephone link equipment was shown working between Farnborough and London, and has obvious applications in undeveloped countries. Pye were also showing their "reporter" mobile radio telephone sets suitable for vehicle mounting or as a transportable short-range V.H.F. radio telephone, self-contained with its battery, and a lightweight V.H.F. walkie-talkie which weighs only 8 lb, complete with battery and head set, and working on a single frequency. Its low weight makes it suitable for extremely light aircraft and gliders.

Redifon, Ltd., Broomhill Road, London, S.W.18, had a ground H.F. R/T. receiving and control station of a type which is being supplied for overseas installation. The unit houses five R.93 fixed-frequency crystal-controlled receivers—four normally in use on different frequencies and one spare—and has the remote controls for the 2 kW G67 four-channel H.F. R/T. transmitters. The receivers are muted, but come to life on receipt of a signal, and indicate the fact with a warning light, so as to ensure that the reply is made on the correct frequency.

There is a 50-watt V.H.F. ground transmitter for approach or airfield control, and an M.F. locator beacon transmitter G142 of 80 watts. The company also makes high-power M.F. beacon transmitters and H.F. radio teletype terminals. A radio teletype transmitter control unit was shown in operation using an Italian teleprinter. The Redifon passenger announcement system for aircraft was described, and has been specified for the B.O.A.C. Britannia fleet.

Standard Telephones and Cables, Ltd. (Radio Division), New Southgate, N.11, were showing a wide range of aircraft radio equipment for communication and navigation aids. The prototype of the STR18C was on show, a 100-watt, 100-frequency H.F. transmitter receiver combination, designed mainly for long-range R/T. work. This is a successor to the STR18B, giving much greater capacity for communication frequencies and accommodating all trunk route R/T. channels. It has been ordered for the B.O.A.C. fleet of Britannia aircraft.

The receiver is crystal-controlled on each of 100 selected frequencies, and the associated transmitter frequencies are derived from the receiver oscillator, the equipment using 101 crystals altogether. Frequency changing on all units is by motor-driven controls, and complete remote control is provided, although provision is made for direct control. The installed weight of a complete single equipment will be about 110 lb. A set of STR19 50-watt H.F. equipment was also shown. It provides R/T. or C.W. on four frequencies between 2.4 mc/s and 12 mc/s, and its application is to smaller aircraft, where its lower power and shorter range may still be good enough for the purpose. It weighs about 80 lb. The other S.T. and C. exhibits included the STR12D, an aircraft V.H.F. set which already has been widely accepted at home and abroad, with 140 frequencies and 10 watts output. It weighs 35 lb against the 25½ lb of the STR9X, a 10-frequency V.H.F. equipment of half the power—5 watts—which was also shown. The SR.14/15 I.L.S. receivers and controls, incorporating a marker beacon receiver, the STR30 radio altimeter, which reads up to 500ft and down to 2ft, and the 100-channel combined V.O.R.-I.L.S.-V.H.F. R/T. were also there, along with their testing sets. S.T. and C. also make a very wide range of high- and low-power ground transmitters, suitable for radio beacons, point-to-point services, and ground-to-air R/T. or C.W. services.

Ultra Electric, Ltd., Acton, London, W.3, were again showing their communication control equipments—the large and small intercoms. These two types are in general widespread use and continue to be specified, e.g. on the B.O.A.C. Comet and Britannia fleets. A complete working demonstration of Sarah, the Ultra search and rescue and homing equipment, was also on the stand; this neat device is for fitting to a life-jacket, or on a dinghy, and weighs about 3 lb with its battery. It has been convincingly demonstrated to home and overseas military authorities. In an allied field are the Ultra electronic control equipments for gas turbines, which regulate jet-pipe temperature and turbine speeds within very narrow limits to ensure best power and fuel consumption. The turbine throttle controllers and synchronizers, as fitted on the Britannia, were also being shown.

Venner Accumulators, Ltd., New Malden, Surrey, were showing silver-zinc accumulators of various capacities. The great advantage of this type of battery is its extreme lightness, compared with conventional lead-acid batteries of the same capacity. The Venner batteries are small as well as light, but their cost is substantially higher than that of equivalent lead-acid batteries.

FLYING BY PERISCOPE

THE conception of periscopic vision for the pilot is by no means new, but recent trends in aircraft design have brought the problem once more into prominence. There are at present two main reasons why the method is deemed worthy of serious consideration. Firstly, it enables the pilot's angle of view to commence from the nose of the aircraft and so eliminates the blind spot caused by this part of the fuselage. This factor is becoming increasingly important as cockpit position moves farther to the rear. Secondly, it enables designers to select alternative positioning for the pilot, since with the addition of a periscope they are no longer limited to a face-forward position. Flight trials have shown that the effects of centrifugal force can be considerably modified by the pilot assuming a prone position, and this becomes quite practicable when periscopic vision is used. One possible disadvantage is that on occasions a periscope in the nose might find itself in competition with search-and-collision radar for the available space.

Pilots have in general not taken kindly to the idea, their main contention being that such indirect vision considerably increases the difficulties of flying, especially of fast or heavy military aircraft. Some experiments in the United States, however, have suggested that this argument can be fallacious.

Reference to experiments by a Dr. Stanley N. Roscoe appeared in *Flight* dated October 5th, 1951. At this time photographs were also published of the Cessna T.50 with periscope fitted experimentally. Dr. Roscoe employed a periscope the screen of which, when viewed from the optimum distance of 15in, presented an image with a preselected degree of magnification of 0.86, 1.20 and 2.00. In his experiments, various screen sizes, varying from 2in to 8in square, were used. Tests in flight indicated that the best results, as might be expected, were obtained with the 8in-square screen. It was stated that a statistical evaluation of the results showed that there was no significant difference between flying efficiency with the aid of the large screen and with direct vision. Subjected pilots found the experience strange at first, but quickly adapted themselves to the new conditions.

The two principal objections which remain are the vulnerability of the periscope to enemy fire, and the restricted angle of view. The latter objection can, of course, be quickly met by the use of a number of periscopes facing in different directions; the former, however, is the cause of much head-scratching among aircraft periscope designers, and the problem has not been completely solved to date.

Amongst the more practical steps being taken to enable immediate serviceability to be effected during flight are prism ejector cartridges which blow out prisms and objectives damaged by gunfire; complete replacement units which can be put in by the pilot with one hand in a few seconds; and special auxiliary viewing devices which can be rapidly brought into action

L.R.C.H.

S.B.A.C. SCHOLARSHIP WINNERS

THE Society of British Aircraft Constructors has issued a list of students to whom S.B.A.C. University scholarships and educational grants have been awarded for 1953. The names are as follows:—

University Scholarships.—(a) Students who have completed their first year studies: Second-year scholarships to D. Fletcher and C. J. Norbury at the College of Aeronautics, and to J. Taylor at Imperial College. (b) New awards: University scholarships to J. E. Wingate (Fairey Aviation), J. P. B. Cuffe (de Havilland Engine Co.), W. P. A. Harris (Boulton Paul Aircraft). These last three students will be going to the College of Aeronautics.

Educational Grants.—Eight awards have been made and, subject to acceptance by the companies concerned, the boys will serve their apprenticeships as follows: D. M. Abraham, Blackburn and General Aircraft; I. R. Bayley, de Havilland Engine Co.; D. M. Bloor, Fairey Aviation: M. W. Davidson (awarded the Sir Nigel Norman scholarship), Fairey Aviation; D. C. Marsden, Blackburn and General Aircraft; M. H. Radford (awarded the John de Havilland scholarship), de Havilland Aircraft; C. M. W. H. Roper, Saunders-Roe; F. A. Smith, de Havilland Aircraft.

FLYING for SPORT

Implications of the Present Lack of Enthusiasm

BY DAVID F. OGILVY

WHAT is the root cause underlying the failure of British sporting flying in these days when the other, more serious side of the picture, in the form of military and commercial aviation, is gaining such an increasingly firm foothold? One obvious reply is that there are very few people who can afford either to own their own machines or to hire club aircraft; but that is merely an easy way out and not a true answer.

If the reason could be traced to the lack of money, the entire state of affairs could be dismissed as sad but irremediable. However, fortunately or otherwise, that is not so; and it seems worthwhile to probe more deeply into the gradual decline that has been the lot of private flying over the past few years—a decline that cannot continue much longer without plumbing a depth from which the movement may never recover.

It is difficult to trace the origin of the rot that has set in, for the blame rests in part with all members of the flying fraternity. Private owners, flying clubs, the aircraft industry and club members themselves must all share it. The fault does not lie with the Government, as so many people like to pretend.

Now for a few examples. Starting with air racing, for that is the section of the game that reaches the public eye more than any other, we find that this year's national events attracted a total entry of about thirty aircraft; this represents about one per million-and-a-half of our population. Many pilots offer peculiar arguments for not racing, varying from fear of damage to the engine to (even) lack of dignity!

There is an answer to each of these quite futile excuses. No one can honestly admit that half-an-hour or so at full throttle is likely to harm an engine, provided it is in a sound condition of health at the beginning. In fact, it is usual to return from a meeting with a far healthier-sounding noise under the bonnet than there was before the race, which itself can almost be considered as giving the engine a healthy line in laxatives.

For the pilot who considers himself above this "puddle-jumping" business, it is interesting to note that slightly more than half this year's competitors were professionals, among them test pilots and airline captains, and that the average amount of experience was quite happily over the 3,000-hour mark. This should prove a suitable rebuff for a certain R.A.F. Meteor pilot who said recently that he had finished with this type of flying when he left his E.F.T.S.

What brings shame upon the private-flying community is the number of competitors who come forward when a large financial reward is offered. The *Daily Express* Race in 1950 produced nearly eighty entrants, because there was the possibility of a thousand pounds at the end of it; but the majority of these so-called enthusiasts have been conspicuously absent from all the other events, in which the chances even of regaining expenses were somewhat remote.

If it is excusable to air a rather personal grievance in this respect, one may recall that the Vintage Aeroplane Club planned to hold two scratch races at White Waltham on July 18th, for Tiger Moths and Hawk Trainers (Magisters) respectively. All owners in the British Isles were circularized with invitations and forms. The result was that *three* Tigers (of which there are 134 on the British civil register) and *two* Hawks (of which there are 60) were entered! But then, there were no large money prizes offered, for the body organizing the meeting had none to give away; it relied, in vain, on the competitive spirit of owners.

Some will argue that racing is not their line; yet whatever form a meeting or competition takes the response remains negligible. There are many ways in which a private or club pilot can improve his standard of flying, and one of the most practicable is that old die-hard, the spot-landing contest. Many an amateur pilot will spend the odd half-hour or so pottering round the local area doing nothing in particular; but if you ask him to put that time to some practical use he fights shy of the idea! That, of course, is lack of enthusiasm, perhaps coupled with lack of self-confidence.

One hears a grouse from time to time that a pupil will have nothing to aim at once he has obtained his P.P.L. To overcome that difficulty the Royal Aero Club introduced four grades of Pilots' Certificates, with ties to match, while a few clubs have brought into force tests demanding a higher general standard of ability than that required for the licence. Yet, when a club takes the trouble to formulate something of this nature, it is almost impossible to badger the eligible member into action; so what, if anything, *is* wanted?

A further sign of declining enthusiasm is even the younger members' reluctance to flying a type that requires the odd item of extra clothing and a helmet. To see a twenty-year-old pupil crawl into a cabin machine in preference to one with open cockpits seems quite illogical, especially when in many cases he will have driven to the aerodrome in an open sports car! With this as the horrid truth, where will one find the sporting pilots of the near future? Or are we going to allow the game to fade away as the few present-day enthusiasts retire from active participation?

From the private-ownership angle, it would be interesting to discover why many of these people actually trouble to own aircraft at all. Frequently the machine may be labelled as a hack business use, but we all know that this is merely so for financial convenience, and no one can be blamed for that. However, if the aeroplane really exists primarily as an enjoyable means of relaxation for the owner, then why not use it as just that? Many an amateur pilot taxies out his mount on a summer evening and flies about for an hour or so, perhaps landing at another club aerodrome for a drink. So far, so good, but when opportunities arise to attend functions that other people have bothered to organize, these individuals are never to be seen; yet probably they will moan in the bars of their home aerodromes that there is little object in owning an aeroplane these days because there is nowhere to go and nothing to attend!

With a few exceptions (and there are a few in each case so far mentioned) flying club committees do very little to warrant their title. After all, those who sit on these committees—i.e., the few who trouble to meet—are elected by the members to do their best for their club as a whole; yet the odd enthusiast who makes an effort towards arousing a healthy and lively spirit is almost invariably squashed by the remainder present—presumably in case they, too, should be involved in a little hard work.

Some people say that the industry should show a greater interest in the lighter side of aviation and that if it did so there would be a marked difference for the better. It is true that only one British manufacturer is producing light aeroplanes for the public today and it is true also that these machines are not the answer to the whole of the sporting pilot's needs; but, on the other hand, if any company could turn out something of Moth calibre it is very unlikely that there would be a worth-while market. It will remain that way so long as second-hand aeroplanes to suit most tastes are available for a few hundred pounds apiece.

So there it is. We can offer no excuse for this national lethargy, for nothing stands in the way of an active and healthy movement except the complete lack of enthusiasm or enterprise among the people in it. The aeroplanes are available, meetings are held for the few who care to attend, and if people can afford to fly at all (as they have proved) they can afford to do so with some spirit of competition.

Let us wake up now, for unless the move from the doldrums starts soon we will be forced to look upon the sporting flying as something of the past—something that belonged to the "good old days" when people could fly for fun.

ALTITUDE TEMPERATURE EXTREMES

IN his inaugural presidential address at the 115th annual assembly of the British Association for the Advancement of Science, held in Liverpool, Sir Edward Appleton, F.R.S., spoke on high-altitude research by radar and rockets.

Recent experiments, he said, had shown that there was a hot layer in the atmosphere at a height of between 50 and 60 kilometres which was actually hotter than the bottom layer touching earth. "As we go above the warm layer," he continued, "we reach a temperature minimum at 85 kilometres, and here we have, we think, the coldest level in the whole atmosphere. . . . It is there that we sometimes see what are called noctilucent clouds. These clouds at very great heights are bluish-white in colour and are very beautiful. We do not yet know what they are made of, but they may be composed of tiny crystals of ice or dust from meteors, comets, or even from volcanoes."

Sir Edward next went on to speak of earth-satellite rockets and then of the military use of peace-time discoveries: he thought it would be wrong of the scientist to refuse to develop new things because those things might be used in the wrong way.

A NEW TECHNIQUE IN THE R.C.A.F

R.C.A.F. Photograph

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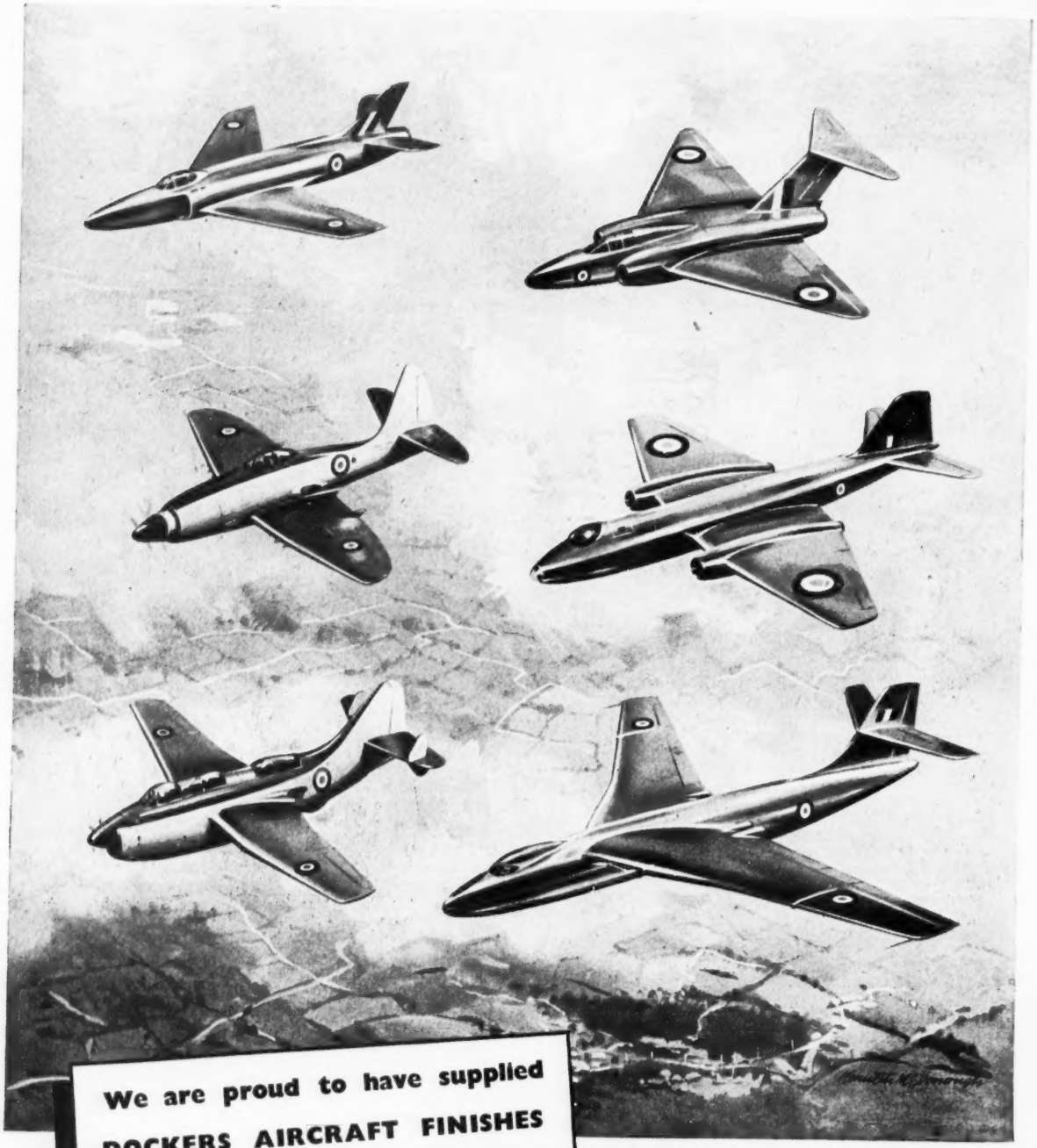

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A VISITOR'S REACTIONS

T.C.A. Chief, at the Show Dinner, Compares U.S. and British Production Methods

Mr. Hugh Burroughes, president of the S.B.A.C., welcomed the guests.

As we briefly recorded last week, the guest of honour at the eve-of-show dinner held by the Society of British Aircraft Constructors at the Dorchester Hotel, London, was Mr. Gordon R. McGregor, O.B.E., D.F.C., president of Trans-Canada Airlines and president-elect of I.A.T.A. (he is to take office at the ninth annual general meeting, opening in Montreal on October 5th.

Mr. McGregor was introduced by Mr. Hugh Burroughes, F.R.Ae.S., president of the S.B.A.C. who proposed the toast of "The Guests." He began by remarking that among almost 1,000 present were representatives of nearly 100 countries who came to see the seventh post-war flying display. It was the fourteenth to be staged in twenty-one years, and, with, the extensive static exhibition, demonstrated substantial advances. The guided missiles indicated something of what was to come—or, he hoped, to go. He continued: "Since our display last September the pattern of the British rearmament programme and its impact on our export trade has materially changed. We are, of course, vitally concerned in putting our new aeroplanes into squadron service as soon as ever possible, but we are no longer attempting to achieve the exceptionally high level of output for the Western fighting services which was envisaged in 1950 by the late Government. What the West has done in the past three years has resulted in some relaxation of world tension. That was, may I remind you, the object of the rearmament programme. The result in the British aircraft industry, and indeed throughout the West, has been to cut off the production peak, leaving us with more resources to cope with wider prospects of trade overseas. Exports from the aircraft industry were running at the rate of £16m per annum, he said, and this was one-third better than last year.

Referring to British gas turbine-powered airliners, he added: "We are amassing that kind of experience for which there is no substitute—day-to-day flying on the routes. The tempo of production is increasing and we are better equipped than ever before to meet world demands for civil as well as military aeroplanes. All selling, including that of merchant aircraft, is largely a matter of providing the right article at the right place at the right time, but you can run into vexatious delays outside the control of the manufacturer. There is, for example, a document known as the Certificate of Airworthiness. In so knowledgeable a gathering as this there is no need for me to say more than that it is our earnest hope that our friends in the United States will speedily see the light and grant to all British Certificates of Airworthiness the same ready validation and acceptance we have accorded to theirs."

Mr. Burroughes continued: "Transport aircraft, both military and civil, give us air mobility which can make so important a contribution to our strategic strength." He recalled that last year he had emphasized that air power meant "combat aircraft plus transport aircraft."

Some of the principal points from Mr. McGregor's speech, dealing with production matters, we quoted in our leading article last week. Somewhat unexpectedly, he began by advocating the light fighter, saying that the amount of unoccupied space within the shell of a modern fighter would permit the addition of absolutely nothing more in the way of plumbing and wiring. To a layman it seemed impossible to believe that, in the first place, any reasonable degree of serviceability could be achieved under operational conditions in the field or that any nation, whatever its capacity, could produce a sufficient number of skilled man-hours to make good the wastage of war of such a fighter fleet.

He suggested that perhaps the Jap Zero of 1943 and the Mig-15 of more recent acquaintance represented a more operational approach to the problem. . . . The gain in performance which might result from simplifying and lightening could offset the loss of some gadgetry, could improve the simplicity of maintenance and manufacture.

Mr. McGregor then turned to the subject of British commercial aircraft. He said that in four years the British aircraft industry had moved from the position of being unable to supply its own airlines and an unprofitable period of converting military types to one in which it had met all the demands of the home market and had on its books substantial orders for export of aircraft to many countries in both the dollar currency area and elsewhere. This was indicative of the pace of development. There were three factors which had contributed to the British aircraft industry's success, said Mr. McGregor. There had been three basic reasons or incentives for this rapid change. First, the country's determination to repair the ravages to its industrial and financial position resulting from the war. Second, the existence in England of a quite unusual number of excellent design brains. Third, the fact that the British approach to the problems associated with the development of airframes and aircraft engines inherently provided more flexibility than in the case of Britain's chief competitor in those fields.

Mr. Gordon McGregor, T.C.A.'s president and president-elect of I.A.T.A.

Of the third factor he had just named, Mr. McGregor said: "To the people who have had the opportunity of watching aircraft types being developed and manufactured, both here and in the United States, it seems that, while many of the problems are treated in an identical or similar manner, there is one tremendous difference. Manpower is such an expensive commodity in the United States that it is becoming increasingly necessary to go to any lengths to conserve it. It is, perhaps, not an exaggeration to say that if there is to be production of only a few thousand of a single component, in the United States it is cheaper to build and install a $100,000 tool if one-half a man-hour of production time is saved per component. This condition is driving the American manufacturer into fantastically large investments in tooling. Where vast production quantities are involved, as in the case of the stock motor car, no harm is done, the ultimate cost of the finished product is kept within reason, and there is assured interchangeability of parts.

"These advantages unhappily vanish where the production of large civil aircraft is involved. The total number of any one type is unlikely to exceed 200 or 300; yet, having been driven into a massive investment in tooling, the manufacturer finds it economically difficult to abandon a design in favour of one more advanced. He might be glad to see the end of the old type, but he cannot, without shedding a tear, scrap thirty or forty million dollars' worth of tooling. This has produced a tendency to retain aerofoils and fuselage sections overlong, and to produce so-called new types by strengthening existing wing-structures, elongating existing fuselages, thus confining basically new design to such matters as undercarriages and installing more power and tankage."

On the other hand, in this country it seemed to the outside observer that lower cost of manpower had made possible its greater use, with a consequently smaller investment in the tooling specific to any one aircraft type. A manufacturer could undertake the production of a comparatively small number of any one type, without risking the financial loss of a large amount of scrapped tooling.

"It would seem to be safe to forecast that only in the mass production of military types will it ever be well to hang around the neck of an aircraft a plant-tooling investment so large that it becomes economically impossible to send that design to honourable retirement."

These opinions brought Mr. McGregor to the remark that the sellers' market since the war had led some manufacturers to produce aircraft which conformed more closely to their own ideas of what was wanted than to those of the customers. British manufacturers had been the first to say, "Tell us what you want and we will design and build it."

After dealing with the rosy side of the picture, Mr. McGregor turned to some other matters. Operators wondered, he said, if British manufacturing methods—with hand-bashing fits—would produce that interchangeability of parts which was so essential, especially to the operator far away from the manufacturing company.

On the important subject of standardization Mr. McGregor said: "Many of us would like to see far faster progress towards world-wide standardization, particularly of ancillary equipment."

A VISITOR'S REACTIONS . . .

It was wrong that a wireless valve and a radio tube—"unbelievably, the same thing"—having the same electronic characteristics should differ in physical dimensions by only those few thousandths of an inch needed to make it impossible to put an American tube into a British valve-socket.

Returning to the subject of civil transportation, Mr. McGregor said that speed was still aviation's most marketable commodity; but, if in order to attain high cruising speeds, there was a proportionate increase in let-down approach and landing speeds, then both safety and regularity standards would deteriorate. An aircraft that was "hot" near the ground would not accommodate itself to even minute errors in pilotage and regularity would suffer, because minimum limits of cloud-base and visibility had to be raised. But even in the fastest aircraft a passenger was making poor time if there were frequent *en route* stops, or other delays, or if the frequency of service meant that he had to wait 20 hours before the flight took off.

With reference to T.C.A.'s order for Viscounts, Mr. McGregor said ties of sentiment played no part in the final decision. . . . To win the test-match the Viscount had to have, and did have, marked superiority in passenger appeal, reliability and economy, and nothing had occurred since the decision was taken, either in progress or co-operation, which had led T.C.A. to have any doubts as to the wisdom of the decision.

Mr. McGregor then said that he would be foolhardy enough to suggest an order of priority to desirable aircraft characteristics. It was as follows: (1) Safety. (2) Short elapsed-time to destination; airspeed; range, frequency; regularity; ground handling. (3) Passenger comfort. (4) Economy of operation. It was only fair, he thought, to remark that no two operators would ever be found who agreed either on this order of priority or even the list of characteristics.

Mr. McGregor addressed some concluding remarks to those guests who, like himself, came from abroad. Over a period of years he had been told, first, that Britain could not defend herself in 1940; secondly, that she would not be able to recover after the war; and thirdly, she would never be in a position to contest the air markets, but that night the guests had enjoyed a good dinner, the language spoken had been English and, next day, the first of the S.B.A.C. Show, they would see aircraft designed, developed, built and powered in Britain, not a few of which had already been sold abroad.

RESEARCH ROCKETRY

Points from the Oxford Conference on Exploration of the Upper Atmosphere

BY reason of the great post-war activitiy of all the major powers in the guided-missile field, during recent years, the peaceful uses of the rocket have tended to pass unnoticed. It was, therefore, a pleasure to attend the recent "Conference on Rocket Exploration of the Upper Atmosphere," which dealt solely with the use of the rocket in pure research. The conference was held in the tranquil surroundings of Queen's College, Oxford, and it would have been intriguing to hear the comments of the 18th-century poet Thomas Tickell, whose portrait looked down on the visitors at dinner, on such projects as the scattering of salt from 50 miles altitude, or the setting up of artificial satellites for cosmic-ray studies.

About 80 "upper-air" scientists were present to hear 25 major papers and a number of short contributions, dealing in the main with the use of sounding rockets in the United States, which is the only country so far to have used them.

During the past six years, about 30 tons of instruments have been carried aloft in V.2s, Aerobees and Vikings to altitudes up to 242½ miles, and vast quantities of data have been obtained. The papers delivered covered not only the determination of the variation of pressure, density and temperature with altitude, but also the distribution of ozone, electron concentration, long-range radio propagation, high-altitude winds, and so on. It is impossible in a brief review to cover all of this work satisfactorily, and so only a few of the more interesting points will be commented on here.

One of the drawbacks to rocket sounding is the expense of the vehicle. Even the simple Aerobee, which is powered by a liquid-propellant rocket motor and is capable of lifting a 150-lb payload to a height of 75 miles, costs $25,000 without instrumentation. This is a lot of money for a mere one or two minutes' recording-time, and Dr. J. A. Van Allen of the State University of Iowa has developed an inexpensive method of getting small payloads to a great height. It consists in lifting a small instrumented rocket to some 50,000ft by means of a balloon and then firing it in a near-vertical direction. In this way almost the theoretical vacuum altitude of the rocket can be achieved, and during this past summer payloads of 30 lb have been sent up over Baffin Bay in this way to heights of 60 miles, in an effort to study cosmic rays near the geomagnetic pole.

One other major drawback to the use of the rocket is the very short time during which it is in the region of interest—two or three minutes at most. For many experiments this is not sufficient, and a great deal more could be accomplished if a stable platform could be established outside the earth's atmosphere—in other words, an instrument-carrying artificial satellite. Although the initial cost of such a project would undoubtedly be very high, the cost per minute of recording time, if power were available for several days' experimental work, might very well be quite reasonable. The general feeling was that the time was not quite ripe to begin work, but that a few years' work by the guided-missile people might well solve many of the outstanding problems of propulsion and guidance.

It is only in rare exceptions that an upper-air parameter can be measured directly, and great ingenuity has been exercised in obtaining the necessary data to allow the various properties to be calculated. One of the main difficulties to be overcome in trying to obtain readings at various altitudes is the fact that the rocket is either travelling very rapidly upwards or very rapidly downwards! This means, for example, that none of the standard methods of measuring temperature is of any use and that various subterfuges therefore have to be resorted to. One of these is measuring the Mach angle of the shock-wave produced by the nose-cone of the rocket, from which the Mach number and hence the temperature may be deduced. Of various methods the only one that has met with success is that of using an array of movable probes, each provided with a pressure-sensitive pick-up. Each time the pick-up moves through a shock-wave, a signal is produced, hence giving the Mach angle.

A completely different approach has been that developed by the U.S. Signal Corps Engineering Laboratories. Grenades weighing four pounds each are ejected from an Aerobee at predetermined heights. Cameras on the ground record the flashes, and thus enable the spacial co-ordinates of the grenades to be determined. The times of arrival of the sound-waves at the ground are measured with a microphone array. With this data the mean speed of sound in the layers between the explosions can be calculated, and hence the mean temperature. The same method can be used to determine average wind-velocities from the effect of the wind on the downward-travelling sound waves. The wind directions over White Sands Proving Grounds, New Mexico, have been found to be easterly in summer and westerly in autumn and winter. The wind speeds appear to reach a maximum at 55 km/hr, the highest measured speed being 102 m/sec.

Of great importance to the would-be space-pilot is the distribution of meteors above the atmosphere, and the results so far obtained in the direct determination of these is reassuring. One technique developed by the Naval Research Laboratory is the simple one of exposing a highly polished metal plate at high altitude and examining microscopically the minute pits caused by the impact of micro-meteorites. A second method, by Temple University, is to install microphones next to the rocket skin and record the impacts. The number of collisions recorded on one flight averaged one per square foot per 2.2 seconds—which is about half the number predicted by astronomers. J.H.

MORE NATO GROUNDWORK

SPEAKING in Paris recently, Mr. L. P. Weicker, NATO assistant secretary for production and logistics, said that 1,800 miles of pipeline would be laid as soon as possible to supply jet fuel to air bases on the Continent. (Details of the system were given on p. 250 of our issue of August 28th last.)

Mr. Weicker revealed the great extent of the pipe system: the major lines will link France, Belgium, Holland and Western Germany, while "minor lines" will be constructed in Norway, Denmark, Italy, Greece and Turkey. Tenders have already been invited for 100,000 tons of steel pipe, and the capacity of the system will exceed 25,000 cu yd per day.

Production of armaments is, of course, already well under way to a co-related plan; the £200m fighter-construction programme is furthest advanced (prominent types being the Hunter, Sea Hawk, Swift and Mystère), while a £250m scheme covering other equipment for land and sea forces is in hand.

CIVIL AVIATION

PUSHER PROJECT: an artist's impression of the Percival P.87, a Dakota replacement to be powered by two Napier turboprops. Carrying 36 passengers or 10,500 lb freight, the machine features rear-ramp entry. A model was displayed at Farnborough.

PROFIT AND LOSS

PROVISIONAL operating results for both the Corporations are disclosed by their respective chairmen in the air transport supplement published last week by the *Financial Times*. Sir Miles Thomas states that B.O.A.C.'s accounts will show an operating profit of "slightly more than £100,000 before payment of interest on issued capital." In the financial year 1951/52 the corresponding figure was almost £1¼m, leaving a surplus after payment of interest on capital of £274,999. The other Corporation's chairman, Lord Douglas of Kirtleside, reveals that B.E.A.'s deficit rose from £1,423,000 in 1951/52 to £1,459,000 in 1952/53. This figure, however, represents 10 per cent of revenue compared with 11.6 in 1951/52. Various reasons are given for these twin set-backs of which the fuel shortage last year was one of the most important.

In the same publication Mr. Peter Masefield contributes a stimulating article on the future of helicopters. He observes that there are now under construction in the United States two helicopters which may be available for passenger services there after about 1956: the twin-rotor Piasecki H.16 50-seater, and the single-rotor Sikorsky S.56, only slightly smaller, both of which will be twin-engined. Today's problem, said Mr. Masefield, is how to fill in the gap between the present experimental and uneconomical services with small single-engined helicopters and the future scheduled commercial operations with the large new British aircraft. On to that question, he adds, "there comes the problem of whether orders for the large American helicopters should be contemplated so as to get economic British helicopter services established three or more years before they would be possible with British machines."

MORE INDEPENDENT SERVICES APPROVED

THREE proposed new air services were approved recently by the Minister of Civil Aviation, acting on the recommendations of the Air Transport Advisory Council. The new services are: A "colonial coach" service between London and Cyprus, by Skyways, Ltd., until October 26th, 1955; a vehicle ferry between Lympne and Calais, by Silver City Airways, Ltd., until October 11th, 1961; and an all-freight service on the route Birmingham-Dusseldorf, or Frankfurt-Copenhagen-Stavanger-Oslo-Stockholm-Gothenburg-Copenhagen-Dusseldorf, or Frankfurt-Birmingham, by Eagle Aviation, Ltd., until August 31st, 1960.

SHEEP AIRLIFT

YORK freighters on B.O.A.C.'s Far East run are estimated to carry a yearly average of 130,000 animals, birds, fish and reptiles. The first large consignment of sheep was flown last week, when a York flew 150 from Singapore to Lod, Israel.

NEW U.S. COMET VIEW?

AMERICAN diplomatic officials in Washington report that the British Air Registration Board is expected to invite the U.S. Civil Aeronautics Administration to send a jet evaluation mission to Britain in November to speed up possible U.S. certification of Comet airliners. According to an agency message from the American capital, an official who recently returned from Britain has reported favourably on what he has seen of the Comets, and was impressed by the amount of the research work being performed at the de Havilland Company.

The officials said also that Civil Aeronautics Administration

VENEZUELAN VIEWS taken at Marquatia Airport. On the left, the stylish terminal building and control tower; on the right, a Viking of British West Indian Airways is seen being refuelled. The airline, which is owned by B.O.A.C., at present operates a fleet of six Vikings and two Dakotas—to be supplemented later by three Viscounts. Nearly 60,000 passengers were carried last year over the 7,000-mile B.W.I.A. network, which links various Caribbean islands with North and South America.

CIVIL AVIATION . . .

knowledge of jets has been based largely on U.S. Air Force jet aircraft and not on civilian airliners.

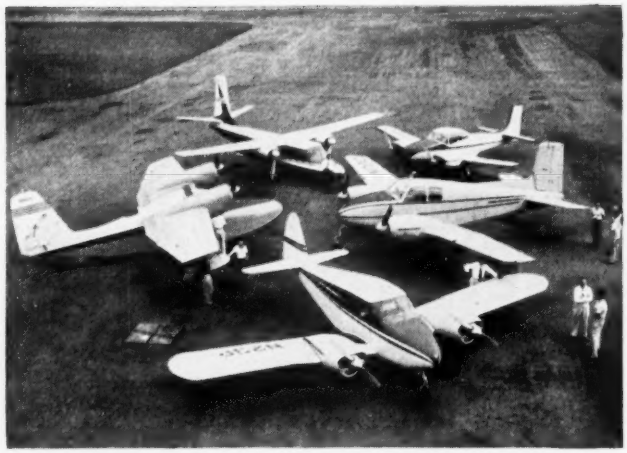
In addition to meeting the Air Registration Board, the U.S. jet evaluation mission is expected to be given personal experience of flying in Comets.

BRAZILIAN NEWS

AN application by Canadian Pacific Airlines for exemption of Customs duties on imported aviation material has been refused on the ground that, although authorized to operate in Brazil, its air services are subject to prior approval by the Brazilian Government. Exemption can be granted only in the case of approved services and provided the Canadian Government extends a similar favour to Brazilian aircraft.

Modifications introduced in Pan American Airways services in August include: (i) two new weekly services between New York and Buenos Aires, *via* San Juan, Caracas, Rio, Sao Paulo, Porto Alegre and Montevideo; (ii) inauguration of Super DC-6 Tourist service on New York-Buenos Aires route, calling at San Juan, Port of Spain, Sao Paulo, Porto Alegre and Montevideo; the round trip means a saving of 120 dollars. The 48 Super DC-6s ordered by PAA represent an investment of $60 million.

The runway at the Galeao Airport, Rio, is now being lengthened from 2,400 to 3,200 metres for the use of jet aircraft when weather conditions are unfavourable.



EXECUTIVES: A pleasing selection of American small medium/twins, all Lycoming-powered. They are the Piper Apache, Grumman Widgeon, Aero Commander, Riley Twin Navion and Beech Twin Bonanza.

BREVITIES

SOUTH African Airways ended the 1952-53 financial year with a profit of £198,527. During 1953-54 the expected increase of £1,205,000 in expenditure will be incurred mainly in meeting the cost of chartering B.O.A.C. Comets and thus improving the airline's overseas service.

* * *

Mr. Ivar L. Shogran, head of the Douglas Aircraft Company's jet transport study and development project, is now in this country to obtain first-hand information on British turbine power plants and turbine-powered aircraft. With M. E. Oliveau, chief European representative for Douglas, Mr. Shogran is exchanging views with major airline operators on jet and turboprop transport requirements.

* * *

Capt. Russell Tapp, of Sydney, line manager of Qantas, arrived in Johannesburg by the Cocos-Mauritius route, for the celebration of the first anniversary of Quantas Sydney-Rand service. Capt. Tapp said that the amount of traffic on the route had fulfilled expectations, but it was too early yet to decide whether an increase in frequency of the service was warranted. An increase would not be considered until Qantas took delivery of its Super-Constellations, the first of which was expected in March.

* * *

First aircraft to land at Johannesburg's £6,000,000 new airport, Jan Smuts Airport, at the official opening on September 1st was a South African Airways aircraft, ZS-BWN. A new road is being built to link the airport, which is at Kempton Park, 14 miles from Johannesburg, with the main Glendower road to the city.

* * *

The second Comet service from Europe to South Africa will start its first flight from Paris to Johannesburg late in September or early in October, according to the South African Minister of Transport. The service will be operated by Union Aeromaritime de Transport, and will take the route through Kano and over the Sahara Desert.

FROM THE CLUBS

A LARGE increase in the number of aircraft C. of A. overhauls performed is reported by the Wiltshire School of Flying, Thruxton. The School's instructors have been very busy since April on an amount of Army co-operation flying; a total of some 350 hours has been flown on this work. Recently, one of the pilots trained by the School, Mr. A. J. Steven, from East Africa, made a return flight to Hargeisa, East Africa, in his own Auster shortly after obtaining his P.P.L.

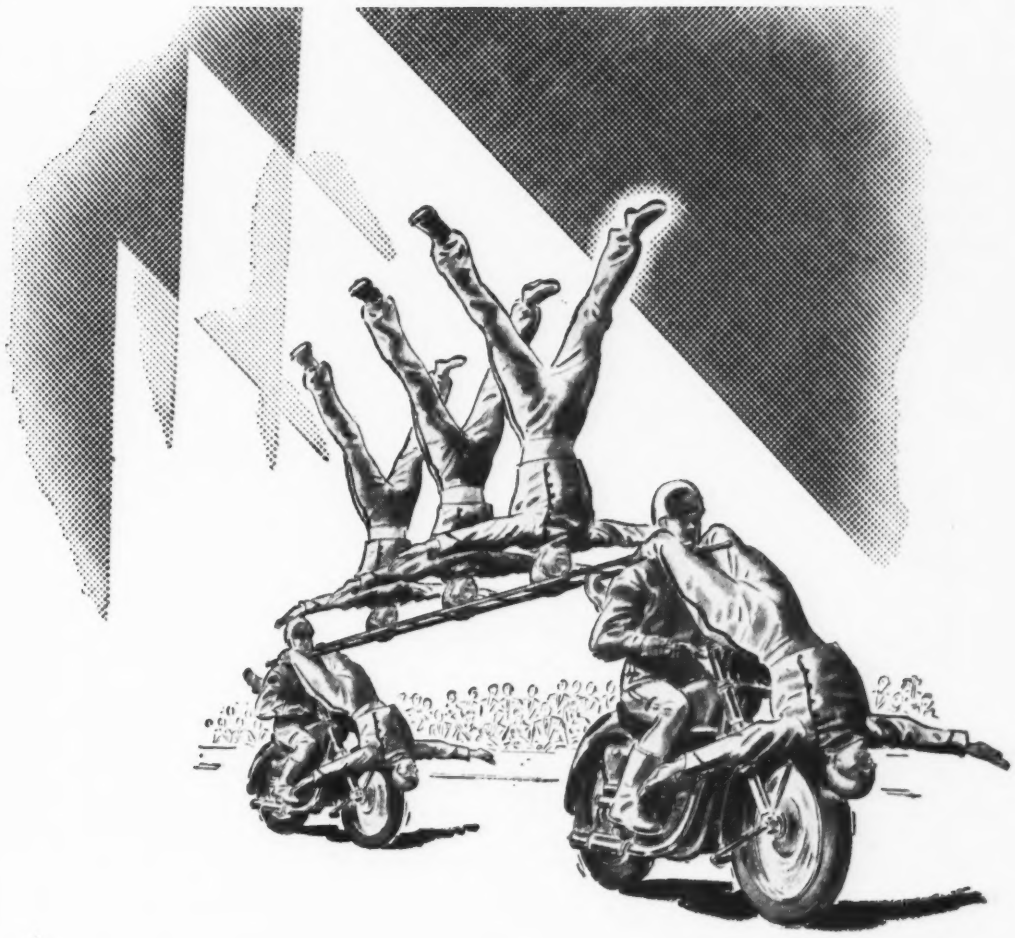
A RECENT appointment to the flying staff of the Elstree Flying Club is of Mr. J. McR. Patterson as a part-time instructor. A first solo has been made by Mr. E. Chappelle, who first flew as an air gunner in the 1914-18 war. Another Elstree veteran is Major H. Petre, who demonstrated a Deperdussin monoplane in 1912, and now flies regularly with the club.

BLUE skies and a warm sun attended the lunch patrol held the Christchurch Aero Club on Sunday, September 6th. The take-off tardiness of the defenders enabled six attacking aircraft (including *Flight's* Gemini) to arrive unobserved—and also enabled a forthright Auster pilot from Elstree to point out rather tactlessly, how much better things were done there. The afternoon's spot landing competition was won by Mr. J. Stone, of the Flight Refuelling Club.

THE Popular Flying Association announces the formation of the Tees-Side Flying Group, which is taking over the Taylorcraft aircraft formerly operated by the Tees-Side Flying Club. The new group is replacing this club, and will be run on co-ownership lines, operating from West Hartlepool Aerodrome.

Other P.F.A. news is that the Motor Tutor, the first post-war ultra-light aircraft to obtain its type C. of A., is being considered by Air Training Corps authorities for the conversion of glider pilots to power flying. Concerning the development of the Coventry Victor "Neptune" engine, which is being modified for use in ultra-light aircraft, the Association is hoping to arrange the necessary flight trials when the engine has passed its A.R.B. type test on the ground.

TO THE BELGIAN CONGO from Elstree, a recent delivery flight was made by Miss R. M. Sharpe, M.B.E., test pilot for W. S. Shackleton, Ltd. The aircraft is an Aiglet Trainer, seen here with pilot at Elstree before the 6,000-mile flight to Leopoldville.



Balance counts in motor oils too!

Your motor oil does three things — it lubricates, it cools and it cleans. Each of these functions is essential to your car's long life and to give you economical motoring. Today chemists can boost the performance of an oil in any of these three directions. But it is important not to sacrifice one quality for the sake of another. Castrol is a well balanced oil — most motorists think it is the best balanced oil. This year more motorists are using Castrol than ever before.

WAKEFIELD Castrol MOTOR OIL

THE MASTERPIECE IN OILS

THANK YOU,

Putting Britain ahead in the air by building a new airliner is a big job, goodness knows. A lot of skilled people have to give a lot of important help. But — when you're thanking

MRS. WILSON,

them all — *please don't forget Mrs. Wilson.* Mrs. Wilson — and 1¼ million people like her — flew British by BEA last year. Her ticket helped BEA to send development engineers to advise

FOR NEXT

on the building of (for instance) the VISCOUNT. Her travel helped to swell the load that (say) BEA ELIZABETHANS are now busy carrying. Mrs. Wilson is the foundation that makes

YEAR'S PLANE...

Britain's civil air supremacy possible. And — if we're going to keep ahead — the more people flying British (like Mrs. Wilson) the merrier!

fly British *keep British aircraft ahead*

BEA

fly **BEA**

BRITISH EUROPEAN AIRWAYS

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

MORE FOR NATO: The scene at Uplands airfield, Ontario, as the pilots of No. 4 Canadian Fighter Wing prepare to take off in their Sabres for Goose Bay, Labrador. After flying the Atlantic, No. 4 Wing will be based at Bad-Soellingen in Germany. Before they left Uplands, the Wing was addressed by Air Marshal C. R. Slemon, the Chief of the Canadian Air Staff.

R.A.F. Appointments

WITH effect from September 21st, A. Cdre. B. D. Nicholas, C.B.E., is relinquishing his post as A.O.C. No. 27 Group, Technical Training Command, to become Director of Radio Engineering at the Air Ministry.

In November, G/C. E. S. Butler, O.B.E., with the acting rank of air commodore, becomes Director of Organization, he is at present Deputy Director (A) of the same directorate, and in December, Act. A. Cdre. W. A. Stagg, C.B.E., takes over the post of Director of Equipment (A). He is at present Deputy Chief of Staff (Logistics) at SHAPE.

Last month it was announced that A. Cdre. C. E. Chilton, C.B., C.B.E., was to become Commandant of the R.A.F. Staff College. This announcement is superseded by a new appointment as Assistant Chief of the Air Staff (Policy). He will assume the acting rank of air vice-marshal. The post at the Staff College will be held by A.V-M. D. Macfadyen, C.B., C.B.E.

Two more appointments announced by the Air Ministry are those of A.V-M. S. O. Bufton, C.B., D.F.C., to be A.O.C. British Forces, Aden, and A. Cdre. J. G. Elton, C.B.E., D.F.C., A.F.C., as A.O.A. at Bomber Command, with the acting rank of air vice-marshal. Both of these appointments are effective from October.

Weapons Trophy Winners

THE first winner of an Inter-Unit Weapons Efficiency Training Cup to be contested annually among the stations of No. 206 Group in the Canal Zone is R.A.F. Station El Firdan. Presentation was made last month by A. Cdre. M. S. Shapcott, A.O.C. No. 206 Group.

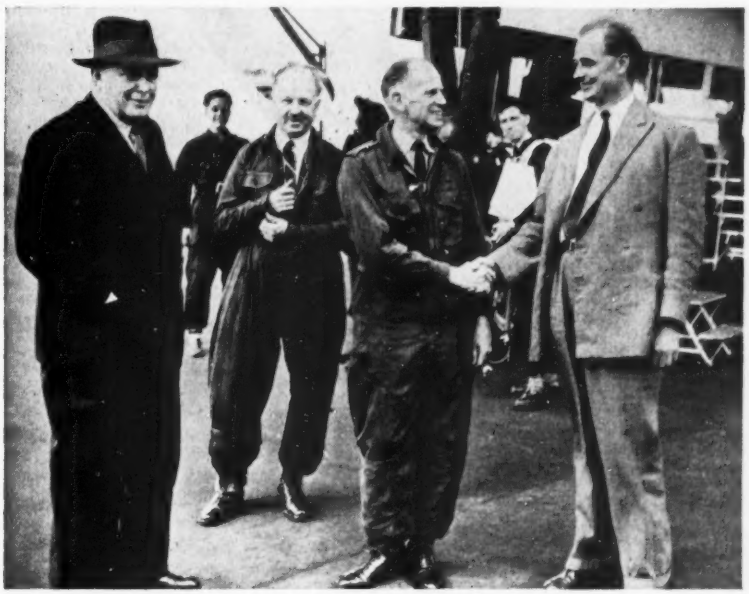
The cup was presented last year by the retiring A.O.C., A. Cdre. F. W. Felgate, C.B.E., to be awarded to the unit producing the best results in annual range practices, which are a part of general service training.

R.Aux.A.F. Appointment

AFTER having served with the unit since 1949, S/L. T. P. Turnbull, D.F.C., has been appointed to command No. 604 (County of Middlesex) Squadron, R.Aux.A.F.

S/L. Turnbull has the distinction of holding both the British and the American D.F.C. The citation for the R.A.F. award, won while serving with No. 542 Squadron in 1944, stated that he had done exceptionally fine work as a pilot on photographic reconnaissances.

AFTER THE MAIDEN FLIGHT of the Vulcan second prototype at Woodford on September 4th: (Left to right) Sir Roy Dobson, Avro managing director; Air Marshal W. A. Curtis, R.C.A.F. (retd.), Avro Canada director; Air Chief Marshal Sir John W. Baker, who becomes Controller of Supplies (Air) next month; and test-pilot Roly Falk.



R.N.Z.A.F. Appointments

IT is announced that A. Cdre. M. F. Calder is to be A.O.C. Royal New Zealand Air Force H.Q. in London, England, in succession to A. Cdre. C. E. Kay, who is returning to New Zealand. At present A. Cdre. Calder is Air Member for Personnel; he will take over his new task in December.

W/C. T. J. MacLean has been appointed to command Whenuapai. He succeeds G/C. R. Webb, who lost his life in a recent air accident.

Against Mau Mau

THE R.A.F. contingent from Rhodesia attached to the security forces combating Mau Mau in Kenya are operating from an improvised air-strip 8,000 ft up in the Kenya mountains, at Merrians Farm. Six Harvards, each fitted with a machine-gun and racks for eight 20 lb. bombs, are piloted by officers from the Rhodesian air training schools under the command of W/C. R. Johnstone, D.S.O., D.F.C. Five Piper Cubs used for reconnaissance.

Victory Club Appeal

AN appeal has been launched by Marshal of the Royal Air Force Sir John Slessor, the new president of the Victory Ex-Services Club, to old R.F.C. members to help in endowing one or more memorial rooms in the club's London headquarters. The branches of all the present Services have already endowed many rooms, but the R.F.C. is so far not represented at all, and this the president is anxious to remedy. The cost of endowing a single room is £500 and a double room £750.

Reunions

ON October 24th, at the Horse Shoe Hotel, Tottenham Court Road, London, W.1, there will be a combined reunion of Nos. 143, 236 and 254 Squadrons. Those wishing to attend should contact G. H. Webb, 48, Hendham Road, London, S.W.17. Telephone: BALham 5337.

The Swiss Hotel, Old Compton Street, London, W.1, is the venue for No. 150 Squadron's reunion on Saturday, October 10th. Tickets, 6s 6d, may be had from L. E. Hodgson, 33, The Fairway, Bickley, Kent.

No. 612 Squadron is holding its reunion in London on November 7th. Particulars may be had from W. N. Parsons, 24, Whitehall Gardens, London, W.3.

SERVICE AVIATION . . .

The Last "Wimpey"

DURING the Battle of Britain "At Home" at St. Athan, South Wales, tomorrow, September 19th, the last remaining Vickers Wellington—the beloved "Wimpey"—will be demonstrated. It is hoped, also, that it will visit some other stations in the south-west on the same day.

The Wellington, a wartime type of renown almost equalling that of the Hurricane and Spitfire, has, for the past eight years, been mainly employed for training purposes. This last summer all were taken out of service and scrapped, with the exception of No. MF 628, a Mk 10 Trainer, now the only specimen in flying condition.

Altogether, 11,461 Wellingtons were built and they were operational right through the war, from September 1939 to March 1945. Operational flying hours from Great Britain totalled 346,440 and in the Middle and Far East a further 524,769. Nearly 100,000 tons of bombs were dropped by them. If the post-war flying hours of 355,660 is added, the grand total becomes 1,226,869, which represents more than 184 million miles.

The geodetic form of construction employed in building the Wellington was devised by Dr. B. N. Wallis, who designed the R.100 and the special weapons used to breach the Möhne and Eder dams.

No. 9 Squadron was the first unit to get Wellingtons, in October 1938, and at the outbreak of war six Bomber Command squadrons were equipped. The first operation brought little glory to the participants. At 6.15 p.m., September 3rd, 1939, nine Wellingtons from Mildenhall, in company with 18 Handley-Page Hampdens from Scampton, took off on what should have been the first bombing raid of the war. They were briefed to attack German warships off the Danish coast but failed to locate their quarry.

The next day, however, 14 Wellingtons, with 15 Bristol Blenheims, took part in an attack on the German naval vessels at Brunsbuttel. In the Battle of Britain period the main task of the Wellington squadrons was the bombing of the concentrations of barges held in readiness by the Germans in Continental ports ready to invade Britain.

Wellington production increased steadily. In September 1940, it was at the rate of 134 a month, and by the Spring of 1941 had grown to more than double this figure. The aircraft itself underwent the normal process of development and improvement, such as the installation of the more powerful Merlin and Hercules engines, and better armament. They were now mainly employed on night bombing, and on April 1st, 1941, a Wellington Mk 2 delivered the first 4,000 lb. "Blockbuster" to Hitler's Reich—on the town of Emden.

By May 1941, there were 21 Wellington squadrons in Bomber Command, and a year later, of the 1,043 aircraft which took off to make the historic 1,000-bomber attack on Cologne on the night of May 30th/31st, 1942, no fewer than 599 were Wellingtons. But by this time, the four-engined "heavies" were coming forward in increasing numbers, and the Wellingtons gradually left Bomber Command, making their last bombing attack from England on October 8th, 1943. They were still widely used by Coastal Command—Wellingtons were the first aircraft to use the Leigh-light for attacking submarines by night—and for training and other duties at home.

It was, perhaps, in the Middle East that the Wellington achieved its greatest fame, remaining as a front-line bomber almost until the end of the war. When Italy entered the war in 1940, the R.A.F. had no long-range bombers in the Middle East, but late that summer a small number of Wellingtons arrived from England. On September 19th, 1940, Wellingtons of No. 70 Squadron made their first night attack on the port of Benghazi. Attacks on this target continued almost nightly for many months, and the "mail run" to Benghazi was immortalised in the 70 Squadron song, to the tune of "Clementine", with the refrain: "Seventy Squadron, Seventy Squadron, though we say it with a sigh—Must we do this blessed mail run every night until we die?" (In Bomber Command, the Wellington had earlier been commemorated in a popular R.A.F. ballad—a parody of "Waltzing Matilda"—with the title "Ops on a Wimpey".)

For the rest of 1940, throughout 1941 and for most of 1942, during the ebb and flow of the Desert battles, the Wellingtons of No. 205 Group attacked targets of various types. During the final advance of 1942-43 they moved to bases near Tripoli, remaining there until the end of the African campaign. Wellingtons were also used by No. 330 Wing, of the British North African Air Force, operating from Tunisia.

In the summer of 1943 all the Wellingtons were grouped near Kairouan, Tunisia, and operated extensively in support of the assaults on Sicily and Italy. During this phase they made a number of remarkably successful attacks on railway bridges in Italy, using 4,000 lb. delayed-action bombs dropped from very low level. At the end of 1943, the Desert Wellingtons at last moved out of Africa to Foggia, Italy, and a wider selection of European targets came within their range. On April 8th, 1944, for one special operation, they reverted to their 1939 role as day bombers, to attack, with 4,000-pounders, concentrations of German troops in the Yugoslav town of Niksic. During the same month they started intensive mining of the River Danube.

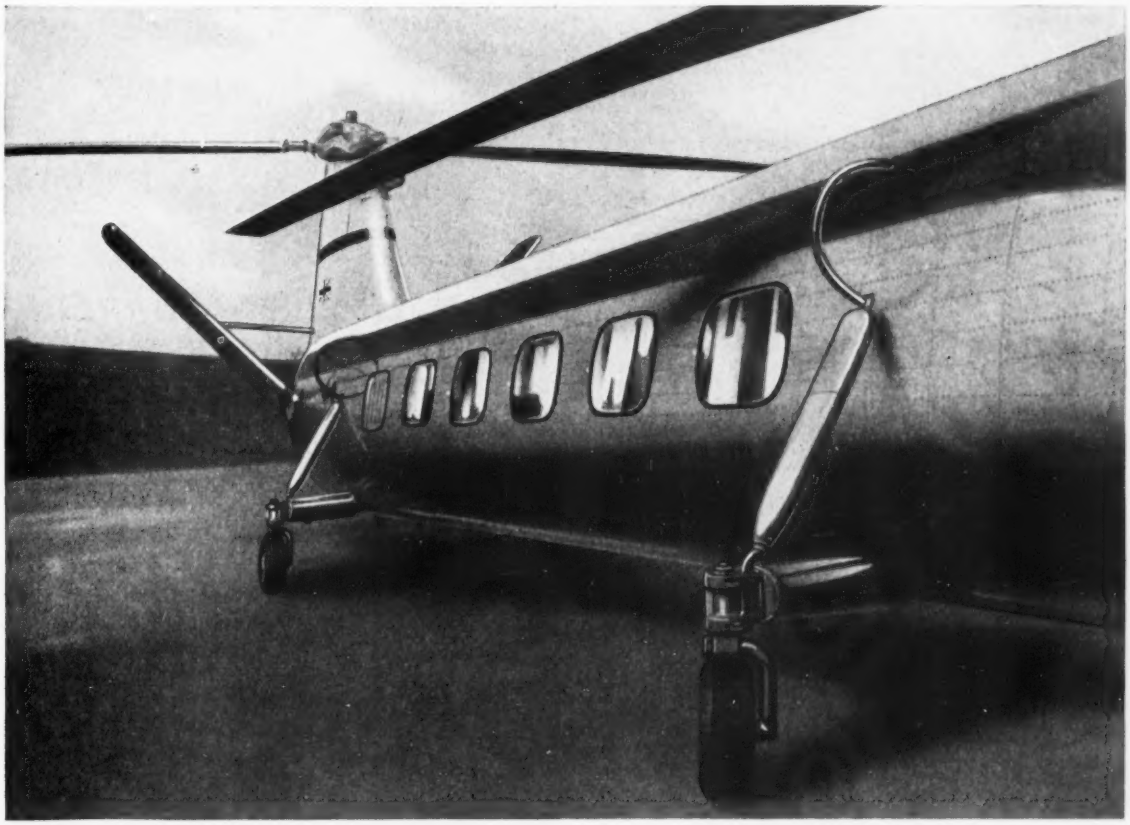
In the spring and summer of 1944, four-engined bombers became available for the Mediterranean area, and Liberators started to replace the Wellingtons, but it was not until March 13th, 1945, that their last operation took place. On that night six Wellingtons accompanied a force of Liberators making an attack on the marshalling yards at Treviso, northern Italy.

ONE MORE OF MANY: A barrage balloon is lowered to allow a Vickers Wellington to be flown out of Brooklands airfield in 1942. The edge of banking of the old motor-racing track, seen in the background is the site of the original flying sheds of 1910.

THE AIR/SEA BATTLE: Parachute mines being loaded on to a Wellington in 1942. In addition to mining, the Wellington did many anti-E-boat patrols over the North Sea and Channel.

BRITISH MESSIER

Helicopter Landing Gear



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Airline and Transport Command Pilots

ALTHOUGH I have no wish to join F/O. Levene in the rather dubious pastime of comparing the relative abilities of Service and civil pilots, I must say that his opinions (August 28th), appear to be based more on prejudice than facts.

He points out that much of the material in the Airline Pilot's Licence examination is taught in the R.A.F. only to specialist navigators; surely then, this must be of use to the civil pilot, for the day of the straight navigator in the profession is over, and his duties are now performed by the second or third pilot.

F/O. Levene goes on to point out that the Transport Command captain is "spared this frightening academic knowledge," but that he is taught the more practical aspects of his aircraft and engines. Quite so, but has your correspondent never heard of the Air Registration Board Examinations which a civil pilot must take for every type of aircraft endorsed on his licence? Mr. Levene should check on some of these examination papers; they would, no doubt frighten him still further.

Your correspondent appears also to be in ignorance of the instrument rating renewal tests and bi-annual flying checks which airline captains have to negotiate under the watchful eyes of a Ministry examiner. These include blind take-offs with engine failure, instrument let-downs with one or two engines feathered, precision flying on basic instruments, etc., after which he is subjected to a technical quiz on his aircraft and ancillary equipment. If his showing falls below a recognized standard, the authorized examiner (who, in the case of the Corporations is a training-captain) has the power to ground him on the spot.

When F/O. Levene talks about the rarity of Transport Command accidents compared with those of airlines, he is way out of his depth. I cannot quote figures at this stage, but I am sure that the two Corporations cover more route mileage in one day than the whole of Transport Command covers in a month, and the accident-rate per route mile is exceedingly low. Furthermore, I would suggest that when a civil airliner crashes, it is such news that the Penny Press spread it over the front pages, giving laymen the impression that the airline business is sheer carnage, but I do think we are entitled to expect a more balanced view from someone who is classed as a professional pilot.

Denham, Bucks. R. E. GILLMAN.

R.A.F. Manpower

RECENTLY questions have been asked about the state of the Royal Air Force and its readiness to meet any emergency. As the first line of defence it should be getting top priority in both planes and men. The aircraft situation seems to be reasonable but it is the general opinion in the service that if the present manning situation does not improve the R.A.F. will cease to be even a flying, let alone fighting, force.

Surely our superiors in the Air Ministry realize that aircraft cannot be kept flying without sufficient experienced technicians. Do they consider the strength of the R.A.F. purely by the number of men and not by trades? Is an orderly room full of clerks more necessary in our air defence than a fully staffed servicing flight? These questions are being asked bitterly in many crew-rooms as more and more aircraft tradesmen depart from the force which was to provide them with a life career, to the more lucrative civilian jobs.

As aircraft become more complicated, their servicing crews naturally become even more necessary. This seems apparent to everyone except those who direct R.A.F. policy. What encouragement is offered to anyone joining the R.A.F. as an aircraft technician at present?

Take, for example, a lad of average intelligence who wishes to become an engine- or airframe-fitter. After his initial training he does a 15-week course and passes out as an A.C.1 mechanic. Three months later he is promoted to L.A.C. and approximately 18 months after entering the Service he becomes an S.A.C. (if he passes a trade and education test). Now he can go no further until he becomes a fitter. This involves taking a fitter's course, which will not be given unless the airman signs on for a further number of years. Eventually, after waiting some time for a vacancy, he joins a fitter's course and after 21 weeks he passes out as a junior technician fitter. Nearly three years will have passed by now, but our junior technician friend can hope for no more promotion until another year at least, when, if he is lucky, his corporal's stripes will arrive.

At the same time as this airman has joined up, one of his friends has signed on as a clerk. He does a 13 weeks' course and after six months is working in an office as an L.A.C. clerk. With or without an S.A.C.'s test he can confidently expect his corporal's stripes inside 18 months from signing on. With the minimum of effort he has, in 18 months, reached N.C.O. status and pay and is holding a comfortable job. His friend the mechanic is still slogging away, outside and inside in all types of weather and at all times of the day and night, without any hope of promotion or pay increase until he has absorbed more "gen" and attained a few more years' experience.

Is it likely then that these mechanics and fitters are going to sign on for further service in the R.A.F.? Maybe in the old days they would have stayed on rather than face the insecurity of civilian life, but at present, with aircraft firms and civil airlines offering good pay for a man's skill, they are not likely to hang on in the Service and be paid merely as another body making up the numbers.

If the R.A.F. is to get the skilled men it needs, the jobs will have to be made more attractive. Rapid and unnecessary promotion on the administrative side will have to be slowed down before we become a force of bureaucrats. More than anything else, technicians should get a higher rate than other trades. The present difference is quite insufficient as compared with the same civilian trades.

Heaven forbid that we become involved in another war, but with the present prevailing conditions the nation should be prepared for the worst and have its armed forces in top-line condition. Unless someone in authority wakes up to the facts, in a few years the R.A.F. will be practically grounded through lack of skilled tradesmen. The sword is no longer being beaten into a ploughshare; it is being worked into typewriters and duplicating machines. Unless some "boffin" invents an aircraft which can be kept flying by clerks and storemen alone, we will soon have ceased to be a fighting force.

Karachi. W. J. H.

"Old Faithful" DC-3

READING an item ("The DC-3 Reprieved," p. 152) in my copy of *Flight* for July 31st, I am immediately prompted to send you a brief account of a truly unique world's record achieved by a DC-3 belonging to Eastern Airlines, Inc., of U.S.A. It went into well-earned retirement on May 1st, 1953, when it flew from Miami to Washington and it now occupies a place of honour at the National Air Museum in the Smithsonian Institute, Washington D.C.

The particular DC-3 concerned—No. 344—was purchased new from Douglas by E.A.L. on December 7th, 1937, and made its last official commercial flight on October 12th, 1952, when it carried a survey party from San Salvador (Bahamas) Island to Miami, Florida. In its *15 years of continuous service* with E.A.L. this DC-3 achieved the following remarkable utilization figures: Total hours flown, 56,782; average flying hours per day, 10½; total mileage logged 8,517,300; passengers carried, 213,000.

Thus, in its lifetime of 15 years of faithful service, "Old 334" (as the E.A.L. crews called it) spent a grand total of 6½ *years* airborne! It operated regularly between New York and Washington, Miami and Chicago, Detroit and Atlanta, St. Louis and Boston, New Orleans and San Antonio.

Thus "Old 334" has beaten by a very handsome margin the record of 39,000 hours logged by A.N.A.'s DC-3 VH-ABR which I referred to in my letter published on your Correspondence Page on October 12th, 1951, and has the truly rare distinction of being preserved, thanks to the National Air Museum at the Smithsonian Institute, whose staff will no doubt take good care of it for many years to come.

Arabia. DC-3 HISTORIAN.

FORTHCOMING EVENTS

Sept.	19.	R.A.F. At-Home Day.
Sept.	20.	St. Albans Model Aero Club: All-Britain Rally, Radlett.
Sept.	20.	Aero Club de Milan: Milan Grand Prix.
Sept.	23-24.	Aerodrome Owners' Association: Annual Conference, Newcastle-upon-Tyne.
Sept.	24.	City of Coventry Freemen's Guild: Lecture "Development of Armstrong Siddeley Gas-turbine Engines," by W. H. Lindsey, M.A., F.R.Ae.S.
Sept.	26.	R.A.F.A. Stansted Branch: Air Display, Stansted Airfield.
Sept.	27.	Aero-Club d'Italia: Modena Air Rally.
Oct.	5-9.	I.A.T.A. Annual General Meeting, Montreal.
Oct.	8.	Start of England-Christchurch (N.Z.) Air Race.
Oct.	9.	Airlines Ball, Royal Albert Hall, London.
Oct.	23.	Aerauto Association: Annual Dinner and Dance, Westminster Arms, Page Street, London, S.W.1.
Nov.	6-11.	"Dates" Air Rally, Biskra, Algeria.
Dec.	9.	Royal United Service Institution: "Effects on the Human Body of High-speed and High-altitude Flight," by G/C. W. K. Stewart, C.B.E., A.F.C., B.Sc., M.B., Ch.B.
Dec.	17.	Anniversary of the Wright Brothers' First Flight.

THE INDUSTRY

Blackburn and General Aircraft Progress

SPEAKING at the recent annual meeting of Blackburn and General Aircraft, Ltd., the chairman, Mr. R. Blackburn, O.B.E., A.M.I.C.E., M.I.Mech.E., Hon. F.R.Ae.S., said that the volume of work at the Brough factory showed a steady expansion, particularly during the early part of the year. "Later on," he continued, "the adjustments to the defence programme caused a reduction or cancellation of some of our contracts, the principal one affected being for the manufacture of the Balliol trainer, the numbers of which were reduced to one-quarter of the original quantity. In consequence, we were unable to recruit further works labour as originally planned, but the upward trend is about to commence again with the growth of work on Beverley production to meet Royal Air Force needs. The second Beverley prototype first flew on June 14th, which was, in fact, rather earlier than expected by the Ministry of Supply. There are extensive differences between the first and second prototypes, and the achievement of beating the Ministry target date reflects great credit on all concerned. A number of the smaller contracts on which we have been engaged during the last few years have been completed or substantially completed, and the main volume of productive effort will more and more be devoted to the manufacture of Beverley aircraft."

At the Dumbarton factory, said Mr. Blackburn, present aircraft contracts are sufficient to provide a substantial nucleus of work for the next two years or more. It was their intention to use the spare capacity for the manufacture of some Beverley components as well as for additional work from other aircraft manufacturers.

Speaking of the company's acquisition of the Turboméca engine licence, the chairman said that preparations for manufacture were going ahead, and technical and production facilities were steadily being expanded to meet the substantial demand which was expected to crystallize during the next year or two.

Of another new development, Mr. Blackburn observed that there was undoubtedly a long-term market for stationary engines to meet industrial demands as well as those of Government or Service departments, and if the engines which the company was developing were as successful as they expected there was bound to be a great increase in the level of their engine work.

Reviewing the balance-sheet, Mr. Blackburn said that profit on trading, before providing for taxation, showed an increase of £127,000 over the previous year.

Official Appreciation

GUEST of honour at the recent gala sports day held by Export Packing Service, Ltd., at Sittingbourne was A.V-M. L. J. V. Bates, C.B., C.B.E., Director-General of Equipment, Air Ministry. After reviewing a guard of honour provided by No. 2230 Sqn., Air Training Corps, he declared the sports meeting open, telling the assembled staff and employees that they were part of an organization in which the Royal Air Force was extremely interested, and which it would not be an exaggeration to call a vital element in our defence. He could not emphasize too strongly the importance of the type of aircraft-packing work done by the company.

"Anything that goes wrong through bad packing not only endangers the lives of aircrews, but it can also wipe out many hundreds of thousands of pounds in just a flash," continued A.V-M. Bates, "and that is why we really do appreciate the work that you are doing. If your work may seem tedious sometimes I would ask you to cast your minds back to the thought that it is a job well worth doing and worth doing well."

From Far and Wide

OF the many gatherings during Show Week, few can have been more international in character than an informal supper given in London by Bryans Aeroquipment, Ltd., for their overseas agents. It was quite a small party, yet France, Belgium, Holland, Switzerland, Italy, Denmark, Norway, Sweden, Portugal, Egypt, the Belgian Congo and Japan were all represented, together with America, Canada and Australia.

Mr. C. E. Stearns and Mr. J. R. Bryans were among the directors who in brief speeches welcomed the guests, the latter telling them something of the new developments in instrument-test equipment which are on the way.

Westland Presentation

AS a token of their appreciation of "a considerate and understanding chief," the members of the commercial department of Westland Aircraft, Ltd., recently presented Mr. A. H. Williams with a Parker '51' pen set. Mr. Williams, commercial manager, has resigned after 13 years' service with the company, in order to take up a directorship with European Trading Corporation A.B., of Karl Gustavagatan, 20, Goteborg, Sweden. He is succeeded by Mr. Harold Penrose, who, as reported in *Flight* of August 21st, will be sales manager. Mr. E. J. Boulgar is to have the post of contracts manager.

IN BRIEF

The sales office of the Aluminium Wire and Cable Co., Ltd., is now at 30 Charles II Street, St. James's Square, London, S.W.1.

* * *

Mr. B. S. Lawrence has joined E. K. Cole, Ltd., as Press officer; he will work in the head offices at Southend-on-Sea.

* * *

Mr. Gordon H. Wheeler, manager of Dunlop's aviation division in Canada, is on a four weeks' visit to this country. He is spending most of the time with the aviation division in Coventry.

* * *

Thirty-four students from 13 universities recently spent a week in Sheffield as guests of the United Steel Companies, Ltd., in whose foundries and laboratories they made practical studies as part of a short course in iron- and steel-making, steelworks engineering and metallurgical research.

* * *

Mr. F. W. Meredith, B.A., F.R.Ae.S., who was among those recently announced as recipients of R.Ae.S. awards and medals, is director of the Cheltenham research laboratories of Smiths Aircraft Instruments, Ltd., and was designer of the Smiths SEP.1 autopilot. His award—the Wakefield Gold Medal—was "for his work in the design of automatic pilots and aircraft instruments."

FIELD DAY: A.V-M. L. J. V. Bates, Director-General of Equipment, Air Ministry, addressed employees of Export Packing Service, Ltd., when he opened their recent sports meeting at Sittingbourne, as recorded in Col.1. Also in the photograph are, left to right, Mr. E. C. Boucher (director, Export Packing), Mrs. E. C. Boucher, Mrs. Bates, Mr. R. C. Boucher (managing director), Mrs. Boucher and Mr. F. L. Porter.

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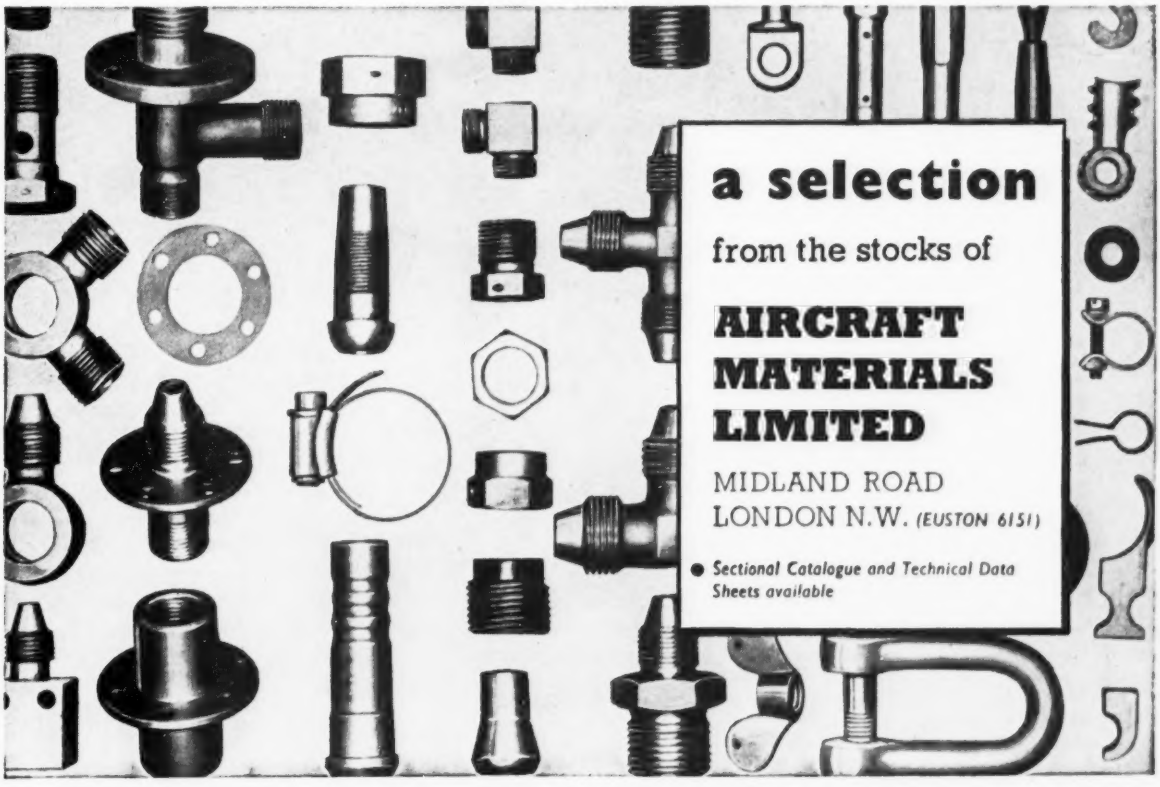

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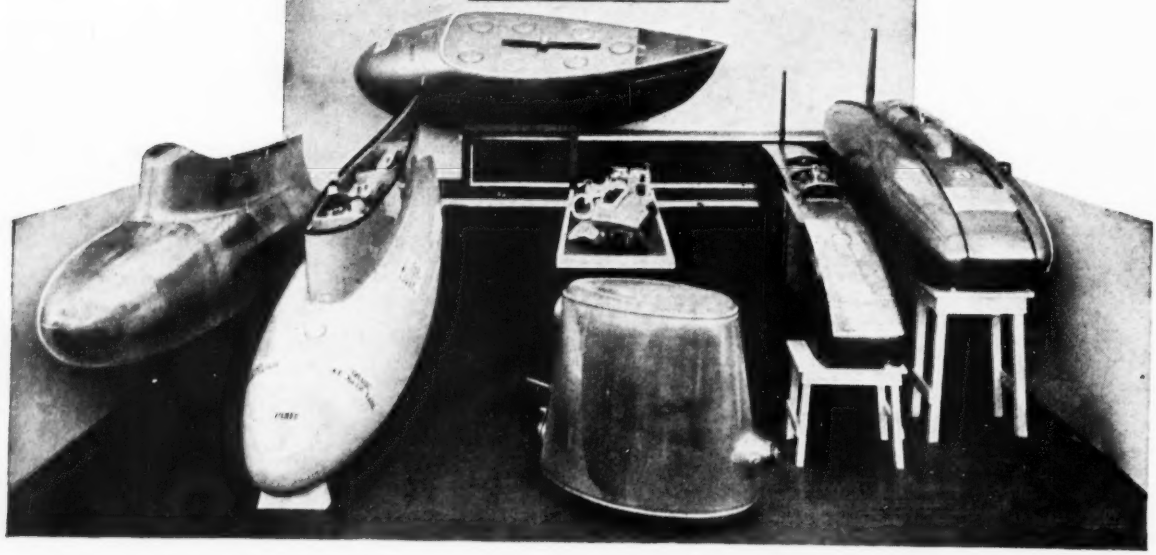

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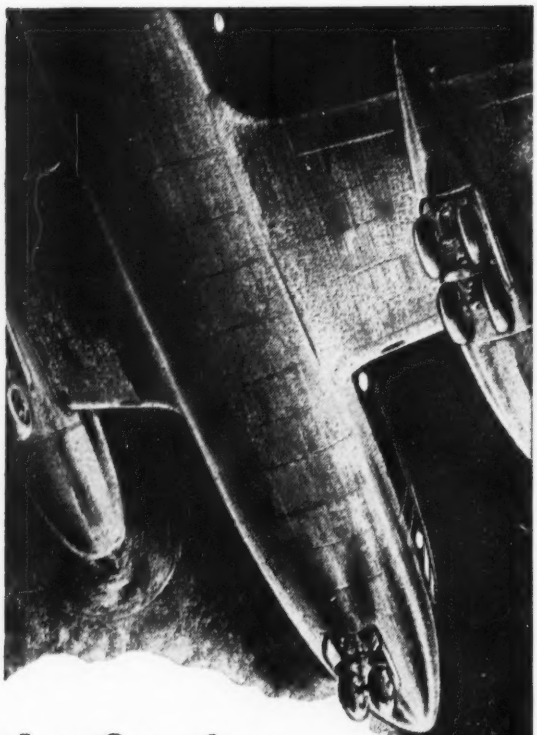

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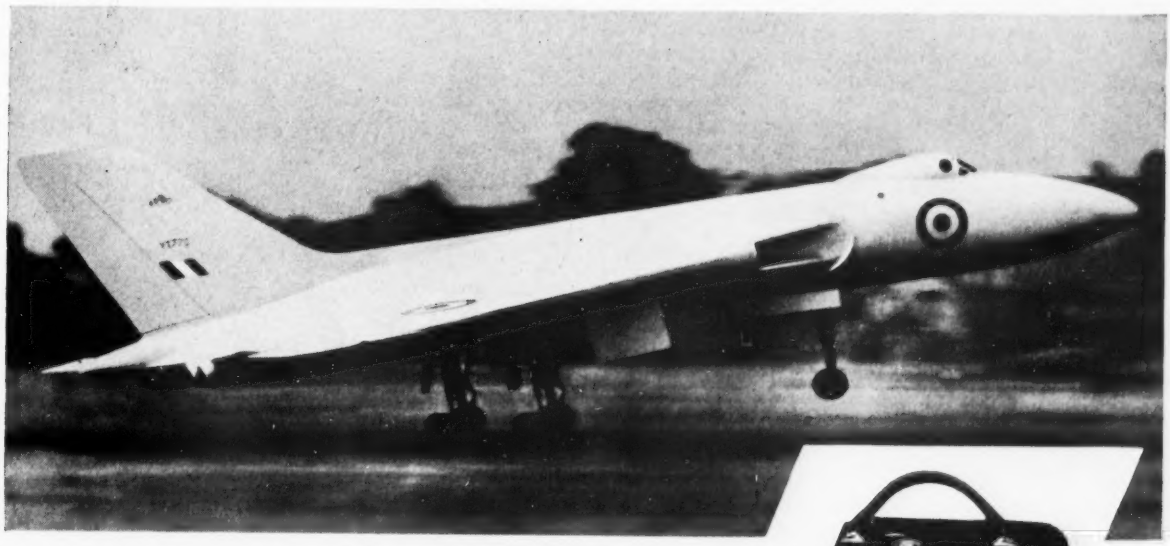

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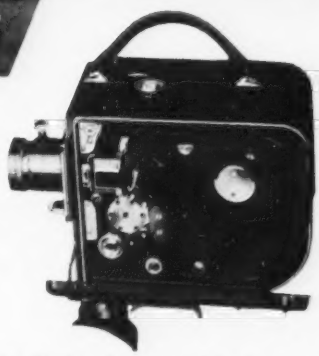

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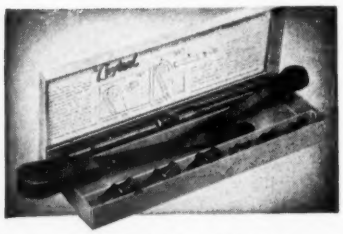

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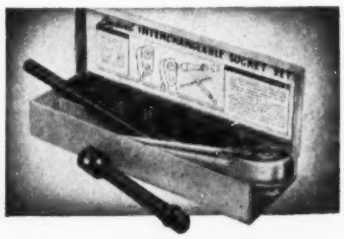

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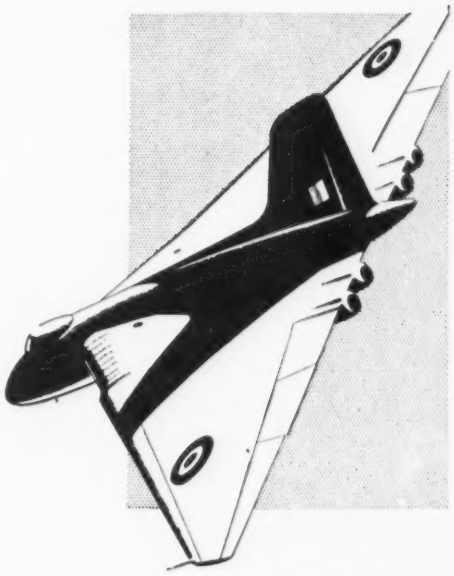

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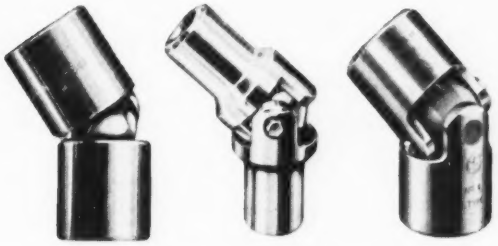

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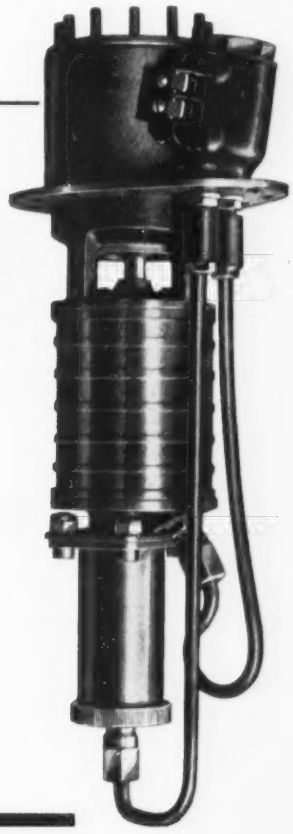

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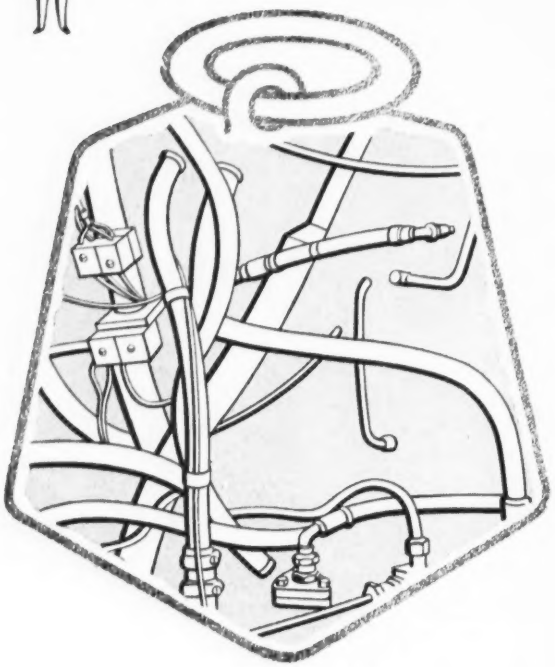

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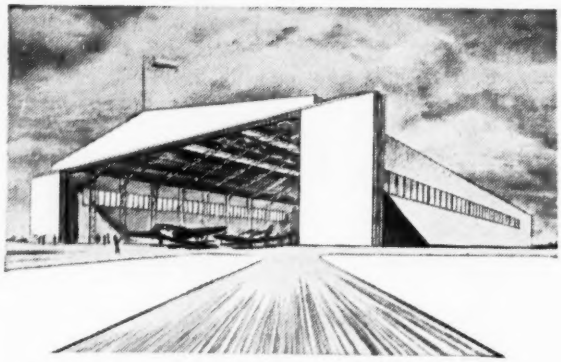

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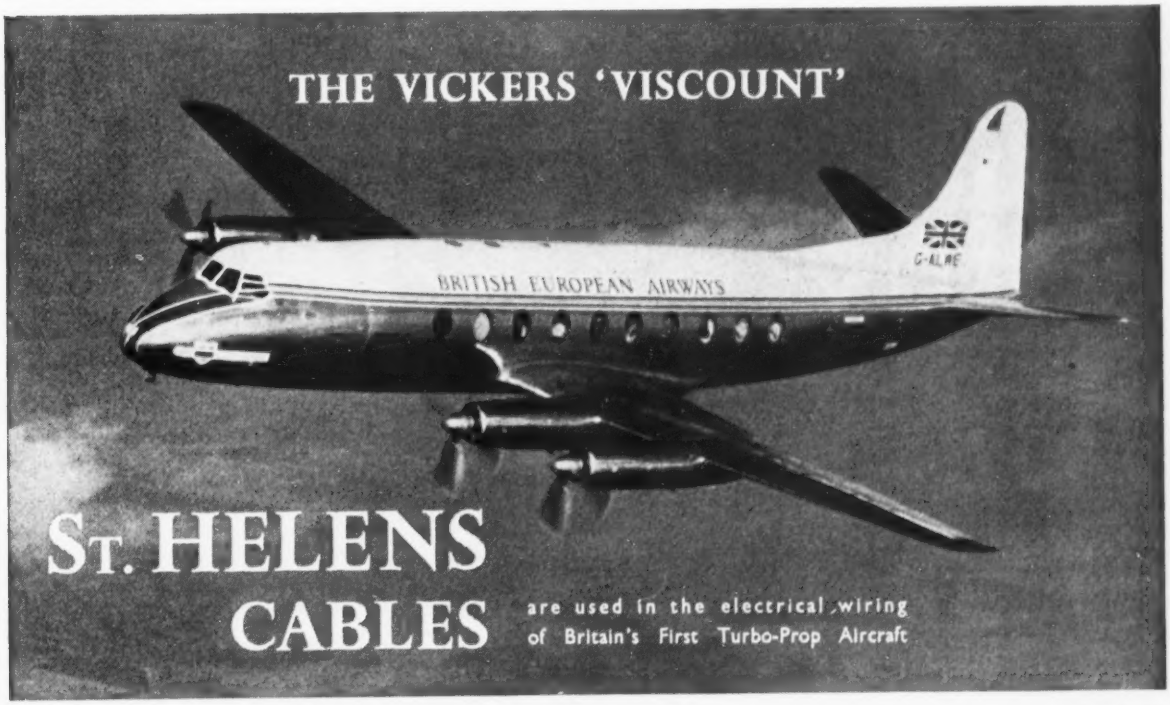

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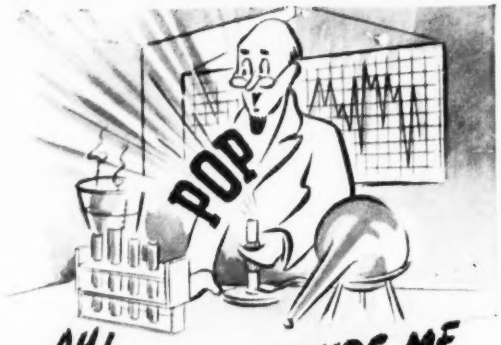

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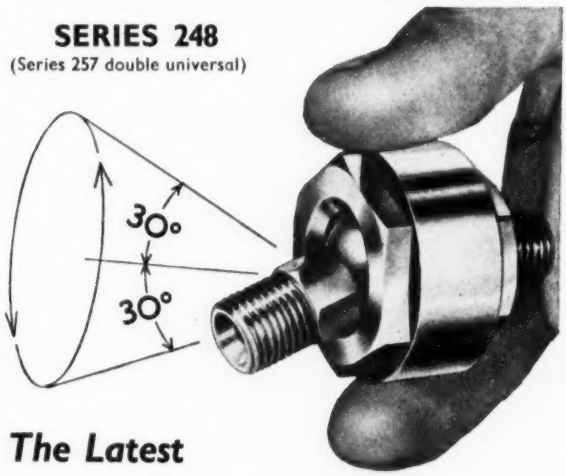

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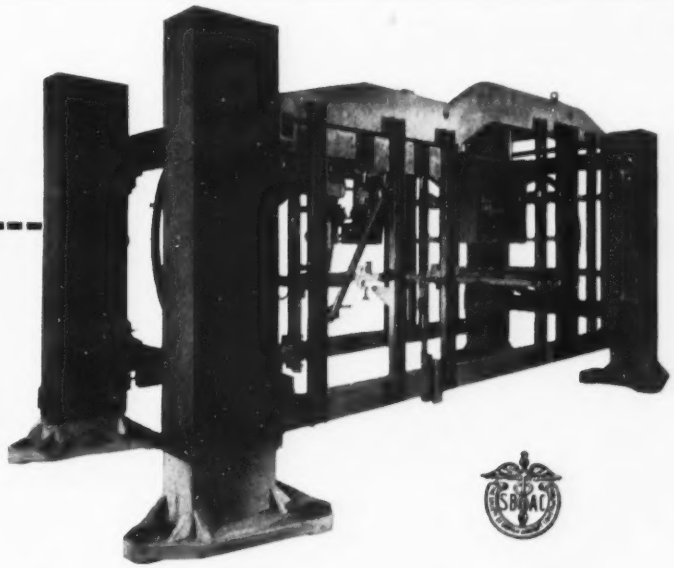

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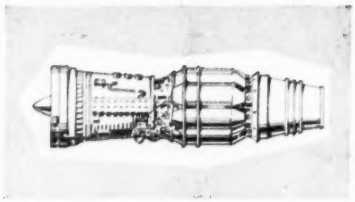

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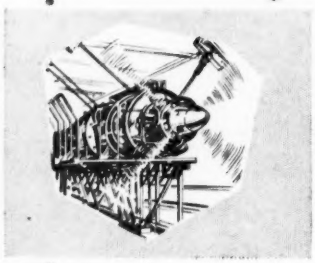

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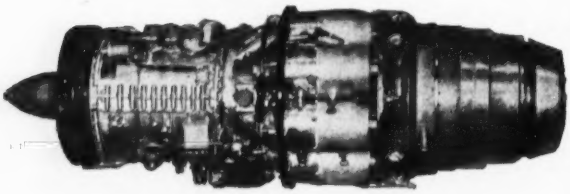

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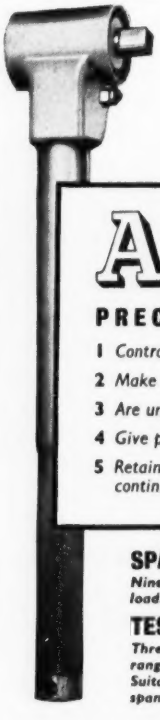

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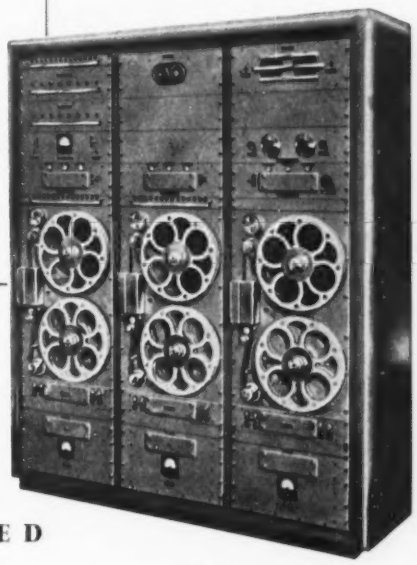

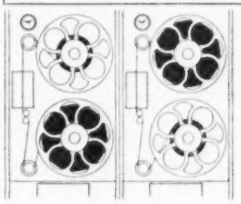

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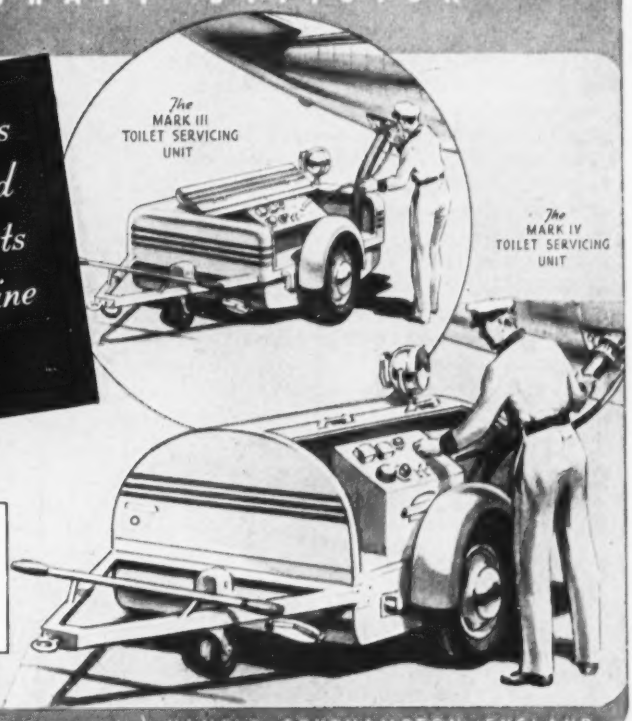

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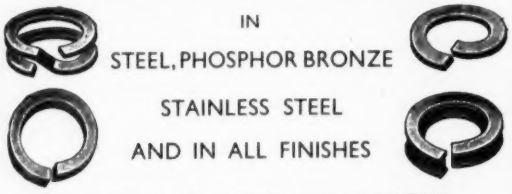

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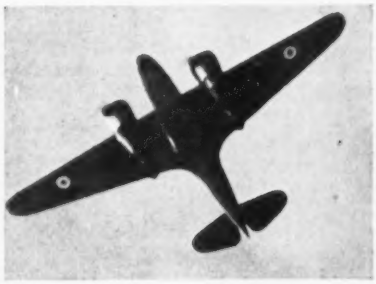

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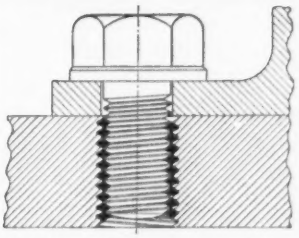

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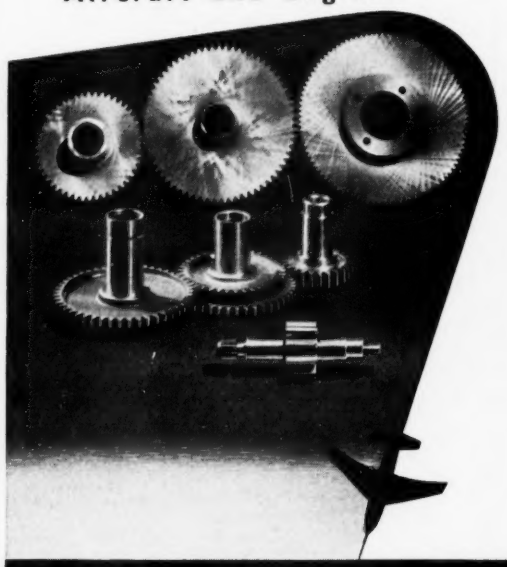

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